SMCM BuckyDiagnost

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⊗ Adjustment Instruction INALFA

Note: ⊗ indicates document present

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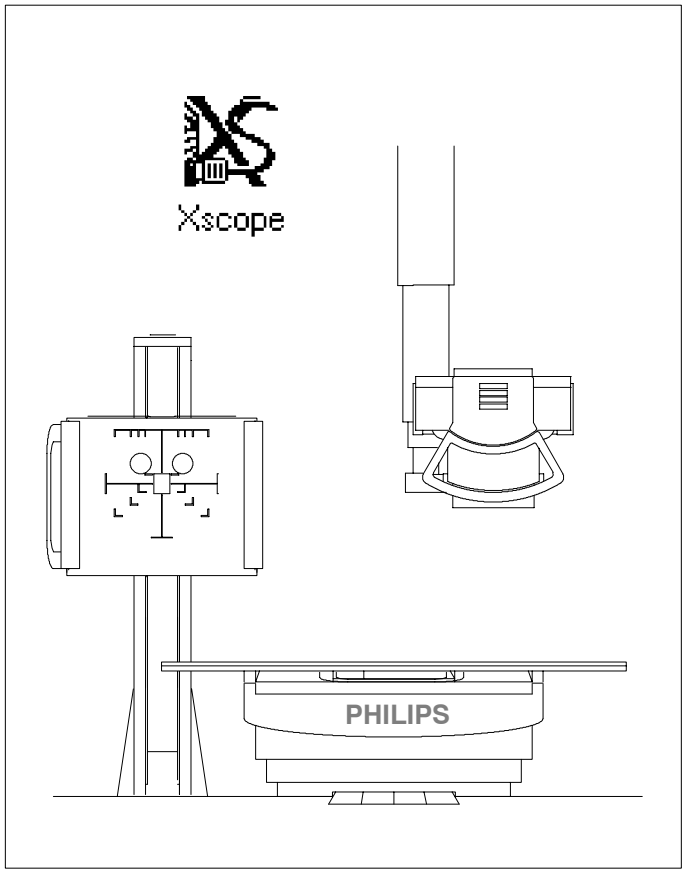
Philips Medical Systems DMC GmbH

SERVICE MANUAL
704
SYSTEM

System Manual Corrective Maintenance

for

BuckyDiagnost



BuckyDiagnost Ceiling System

DMC Hamburg

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SERVICE MANUAL - SUBSYSTEM

SMCM BuckyDiagnost

Author: M. Hasche

In case there are any questions concerning this manual,
please send this LOPAD via fax to 49/(0)40/5078 2481

File: SMCM bD_25651AE

List of pages and drawings (LOPAD)

Manual Order No: 4512 984 25651
released: 09/2004

0.1 223 mm (Rosa Karton)

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1. Introduction

This documentation is valid for BuckyDiagnost systems. A system includes a bucky controller for system operation at every time.

2. Compatibility

- Bucky unit non format sensing	9848 500 2030_
- Bucky unit with format sensing	9804 609 6030_
- Bucky unit with format sensing	9848 500 2040_
- Automatic cassette loader (ACL4)	9848 600 02021
- BuckyDiagnost CS	9890 010 06522
- Tabletop standard	9890 010 02194
- Tabletop aramid	9890 010 02204
- Tomo 2 device BuckyDiagnost TH	9848 600 02561
- System control BuckyDiagnost	9848 500 22701
- Heightsensor for BuckyDiagnost TH	9848 500 22601
- Grid 36/8 FO 100	9860 834 90101
- Grid 36/8 FO 110	9896 010 26081
- Grid 36/8 FO 140	9896 010 26091
- Grid 36/12 FO 100	9860 836 90101
- Grid 36/12 FO 110	9896 010 26001
- Grid 36/12 FO 140	9896 010 26071
- Grid 36/12 FO 180	9896 010 26041
- Grid 40/12 FO 100	9860 846 90101
- Grid 40/12 FO 110	9860 846 90111
- Amplimat chamber	9890 000 01611

Options:

- Footswitch locking device	9890 010 02712
- Second table control	9890 010 02731

Accessories:

- Adjustable head clamp	9804 662 33009
- Pair of handgrips	9804 662 43009
- Ratchet compressor	9804 666 22009
- Symm. ratchet compressor	9804 666 22109
- Lateral cassette holder	9804 666 32009
- Cassette holder, hor. beam	9804 668 10009
- Pair of leg supports	9804 668 50009
- Infusion bottle holder	9804 669 10009
- Pair adj. positioners	9804 669 20009
- Park frame for accessories	9804 669 30009

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Upgrades for BuckyDiagnost TH2

- Upgrade f. bucky brake TH	9890 010 02881
- Upgrade sec. table contr. TH	9890 010 02901
- Upgrade footswitch look	9890 010 02912
- Upgrade kit tracking	9890 010 80191
- Upgrade kit high load	9890 010 81251
- Upgrade kit key switch for bucky TH	4512 130 82901
- Upgrade kit tracking	9890 010 80191

3. Technical data

3.1. Mechanical data

- See special documentation of subsystems and units

3.2. Electrical data

- See special documentation of generator

3.3. Environmental conditions

According to PMS standard UXN 13600 class C1 (indoor temperature controlled)
during regular work:

- Ambient temperature:	+10°C ... +40°C
- Relative air humidity:	20% ... 80%
- Air pressure:	700hPA ... 1100hPA

during storage / transport:

- See special documentation of subsystems and units
- See special documentation of generator

4. Dimension of Boxes

- See special documentation of subsystems and units
- See special documentation of generator

5. Scope of delivery

- See special documentation of subsystems and units
- See special documentation of generator

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6. Site preparation

- See room layout (floor fixing) (Refer to PRD)
- See special documentation of subsystems and units
- See special documentation of generator

7. Movements

- See room layout (Refer to PRD)
- See special documentation of subsystems and units
- See special documentation of generator

8. Tools / Material required

- See special documentation of subsystems and units
- See special documentation of generator

9. Test equipment

If the BuckyDiagnost is installed with a bucky controller:

- Service PC with installed windows program X-Scope, minimal MS Windows 3.1 is required
- X-Scope cable 4512 130 56931

10. Mounting Place

- See special documentation of subsystems and units.

11. Installation

- See special documentation of subsystems and units.

12. Connection Location

- See special documentation of subsystems and units.

13. Labels

- See special documentation of subsystems and units.

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14. Electrical Connection of a full BuckyDiagnost system

The system will be supplied with sets of cables including plugs connected one side.

14.1. Earthing

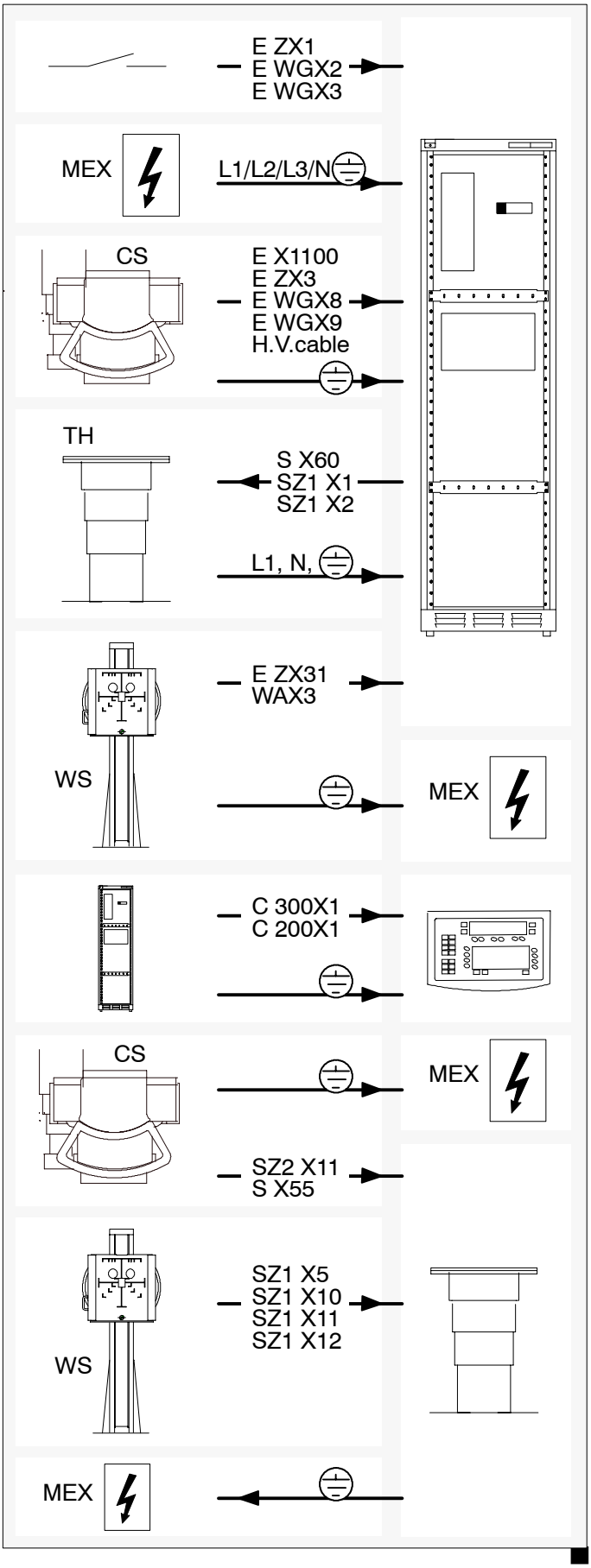
- Install the earthing cable and connect them as named.

14.2. Power Supply and Signal Cable

- Install the cables and connect them as named.

Note:
Figure shows all possible connections.

named cable going to



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FAULTFINDING
TEXT

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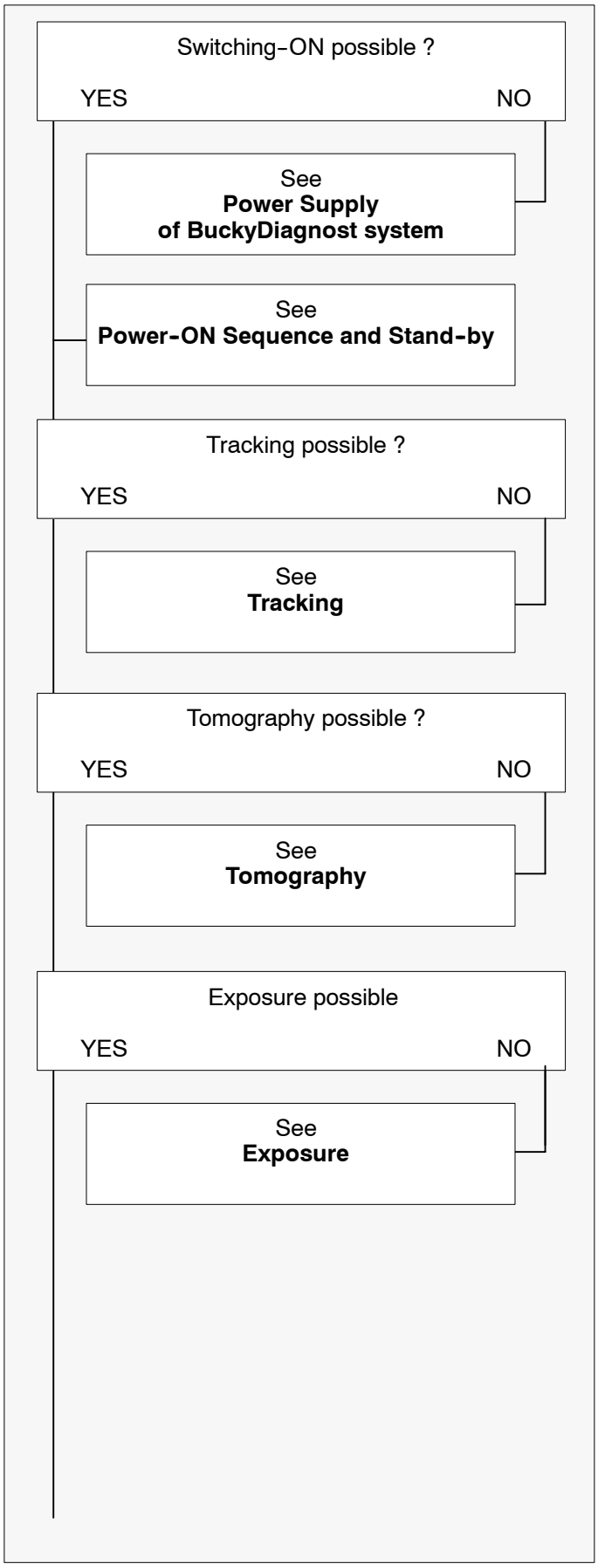
1. System Faultfinding Guide

1.1. Introduction

A CAN bus controlled system includes a bucky controller to memorize a fault and information data.
See also
Faultfinding Guide with Error Code.



1.2. Convention

ON = current circuit is closed
switch is closed
LED is lighting

OFF = current circuit is open
switch is open
LED lights not

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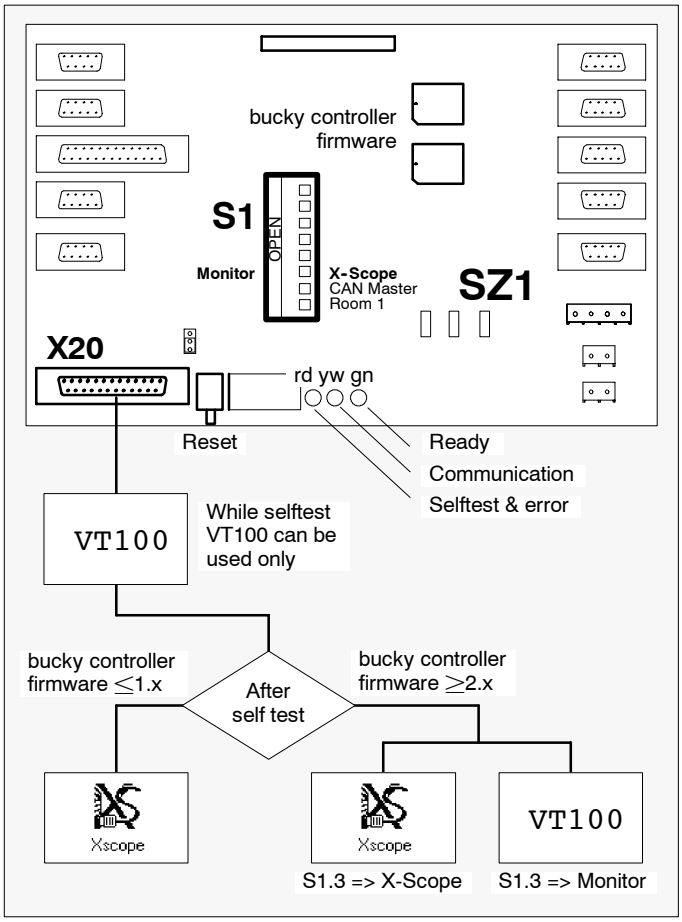
1.3. Conditions of X-Scope & VT100 Use

After a successful selftest the status LEDs are flashing.

All controllers are communicating with the host controller placed on the bucky controller board. The yellow flashing LED indicates busy for communication.

If the BuckyDiagnost system fails, connect a service-PC to the bucky controler board, use X-Scope or VT100 as shown in the figure.



The BuckyDiagnost system runs through a selftest after power-on.

- Switch **ON** the system.

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2. Faultfinding Guide with Error Code

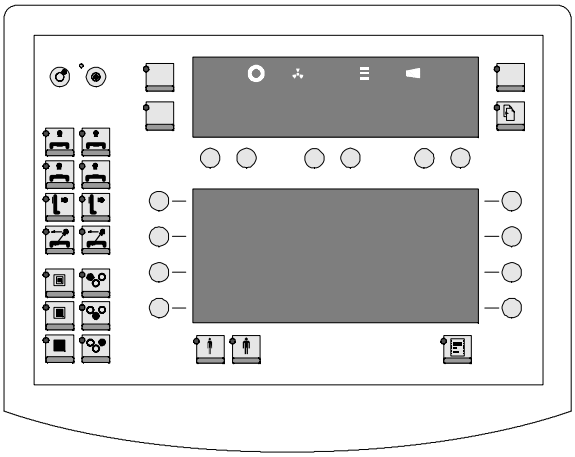
Error Messages

Errors without displayed error code on the Control Desk or Control Handle

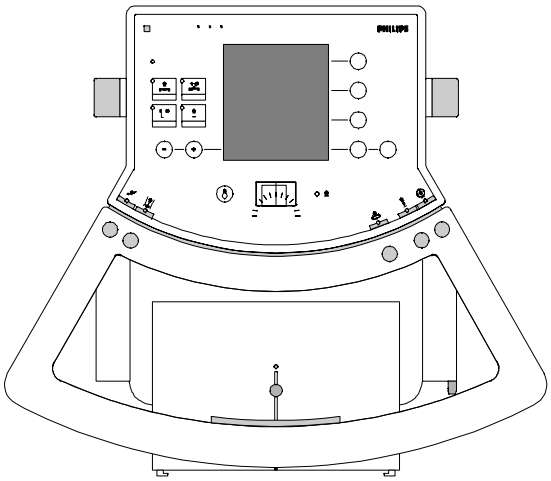
See SMCM

Errors displayed on the Control Desk

See Generator Faultfinding



Errors displayed on the Control Handle



0200 ... 0258	Tomography Run
0300 ... 0304	bucky Controller & Service Data
0400 ... 0416	CAN Bus
0700 ... 0712	System
0800 ... 0803	Collimator
0900 ... 0918	Position Coordinates
1000 ... 1019	bucky Controller & Selftest
1100 ... 1106	Control Handle
1200 ... 1205	bucky Controller
1300 ... 1305	Tracking

Software code is relevant to bucky controller firmware up to R5.2

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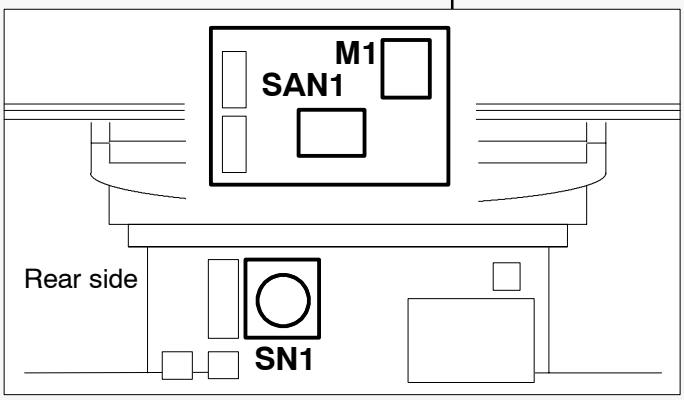
3. Error Code 0200 ... 0258 Tomography Run

3.1. TOM1> TRAY

0200 ... 0258
Tomography Run

0200
Tomo node state unknown
→ ?????

0200
Tomo drive int error



TOM1> TRAY:
Jumper not correct
→ Check jumper on **SAN1 X7**

SAN1 X7 ☒ = connected

TOM1> TRAY:
author. current exceeded
→ The tomo drive modul **SAN1** needs too much current. Make sure the tomo drive moves freely.

TOM1> TRAY:
motor supply error
→ Check power supply **SN3**

TOM1> TRAY:
low voltage motor
→ Motor power supply out of range

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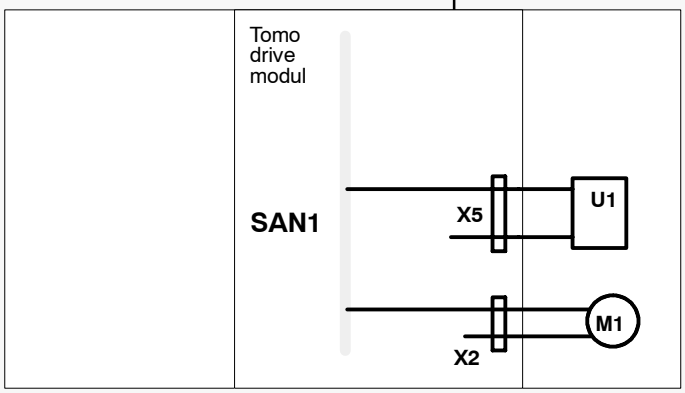
TOM1> TRAY: low voltage motor electr	Motor controller power supply out of range
TOM1> TRAY: short cct motor clutch	Replace tomo drive modul
TOM1> TRAY: difference in position	Check encoder **U1** on tomo motor **M1**
TOM1> TRAY: turn direction error	Check tomo motor **M1** Check drive modul **SAN1**



TOM1> TRAY: motor blocks	The tomo drive modul needs too much current, e.g. the cassette was pushed strong
TOM1> TRAY: reached SW limit switch	The cassette tray is out of operation range ≥xx mm from the

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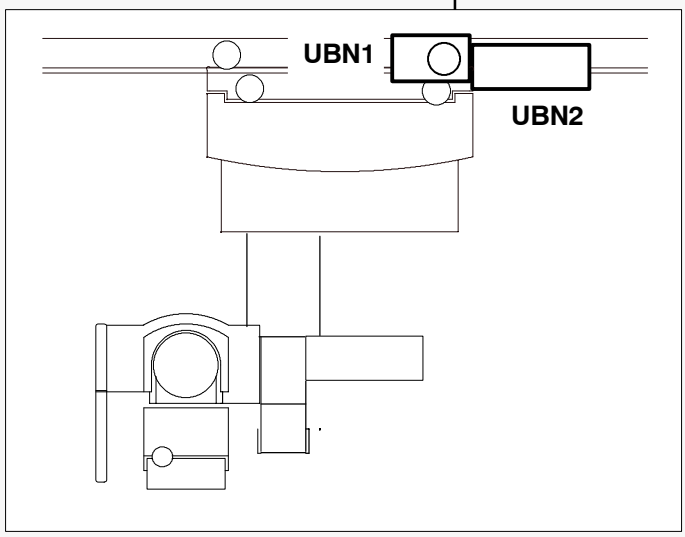
3.2. TOM1> CS

0200
Tomo drive int error



TOM1> CS:
Jumper not correct

Check jumper on **UBN2 X7**

UBN2 X7 ☒ = connected

TOM1> CS:
author. current exceeded

The tomo drive modul **UBN2** needs too much current. Make sure the tomo drive moves freely.

TOM1> CS:
motor supply error

Check power supply **UBN1**

TOM1> CS:
low voltage motor

Motor power supply out of range

TOM1> CS:
low voltage motor electr

Motor controller power supply out of range

TOM1> CS:
short cct motor clutch

Replace tomo drive modul

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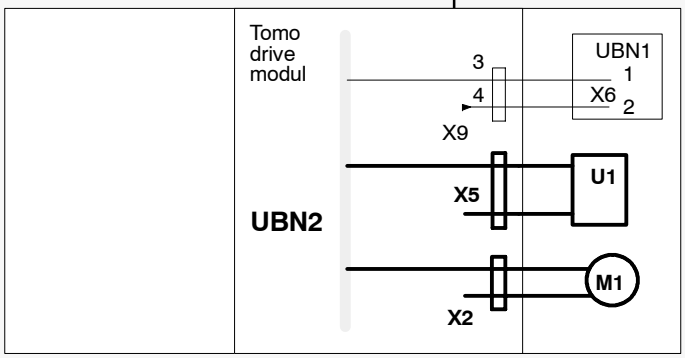
TOM1> CS: difference in position	Check encoder **U1** on tomo motor **M1**
TOM1> CS: turn direction error	Check tomo motor **M1** Check encoder **U1** Check drive modul **UBN2**
TOM1> CS: motor blocks	The tomo drive modul needs too much current
TOM1> CS: reached SW limit switch	CS is out of operation range ≥1.5m from the centre position Service tip Call program VT100 Bucky> set service tomo_t_accel 250↵ acceleration ≧ motor current or decrease the distance of the CS tomography run longitudinal by SID decrease, e.g. 110cm.



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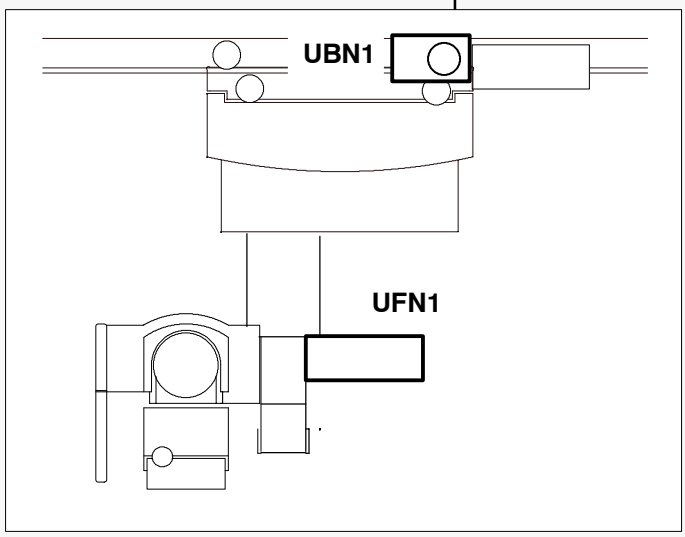
3.3. TOM1> ALPHA

0200
Tomo drive int error



TOM1> ALPHA:
Jumper not correct

Check jumper on **UBN2 X7**

UFN1 X7 ☒ = connected

TOM1> ALPHA:
author. current exceeded

The tomo drive modul **UFN1** needs too much current. Make sure the tomo drive moves freely.

TOM1> ALPHA:
motor supply error

Check power supply **UBN1**

TOM1> ALPHA:
low voltage motor

Motor power supply out of range

TOM1> ALPHA:
low voltage motor electr

Motor controller power supply out of range

TOM1> ALPHA:
short cct motor clutch

If present: Motor clutch **Y1** fails, replace tomo drive modul

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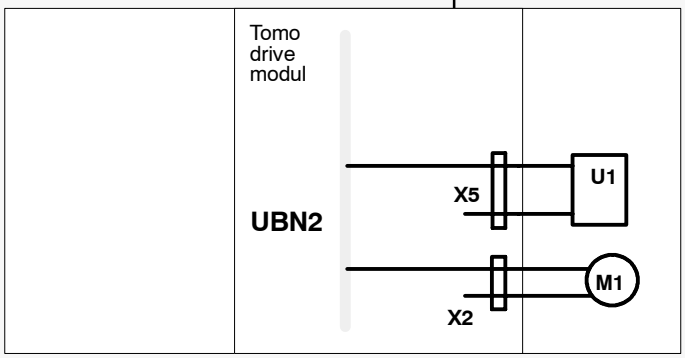
TOM1> ALPHA: difference in position	Check encoder **U1** on tomo motor **M1**
TOM1> ALPHA: turn direction error	Check tomo motor **M1** Check encoder **U1** Check drive modul **UBN2**
TOM1> ALPHA: motor blocks	The tomo drive modul needs too much current
TOM1> ALPHA: reached SW limit switch	ALPHA is out of operation range ≥xx mm from the
TOM1> ALPHA: reached servo limit switch	Warning only



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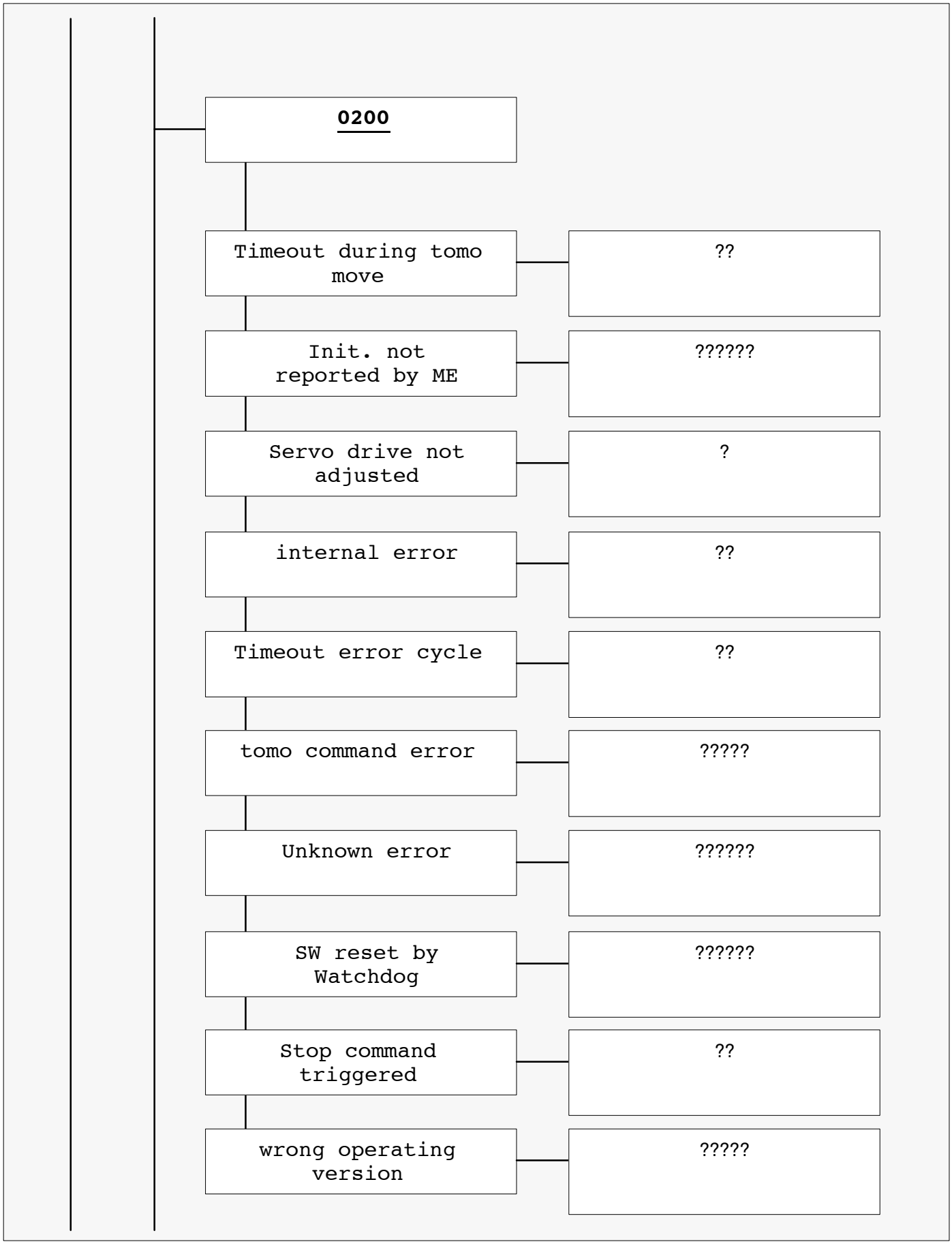
3.4. Error Code 0200 ... 0258



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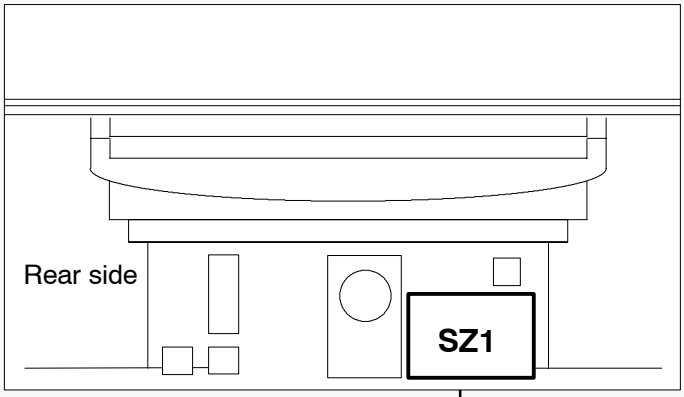
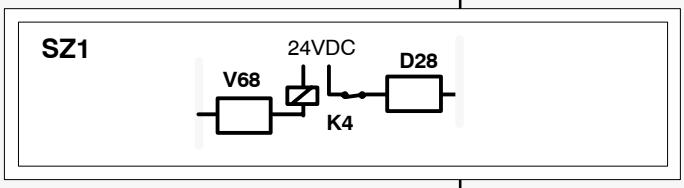
0201
Tomo drive CAN event

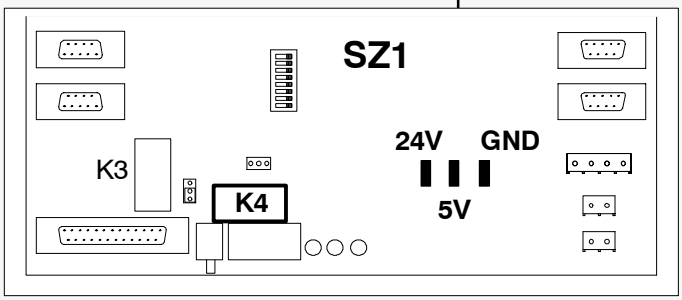
Only warning message



0202
Tomo test relay stuck

Check relay **K4** on **SZ1**





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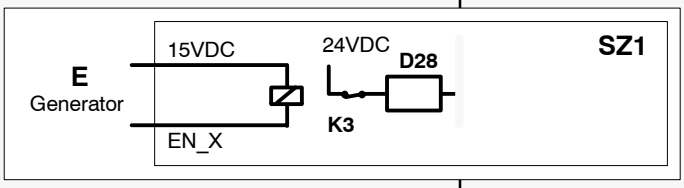
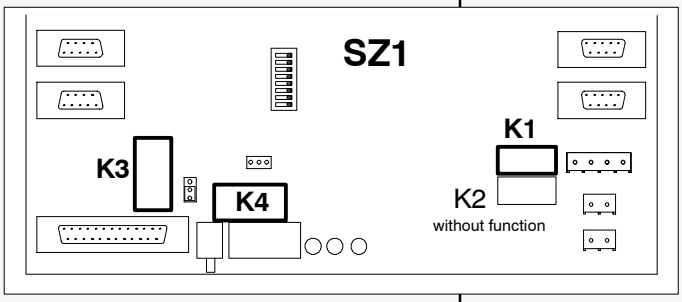
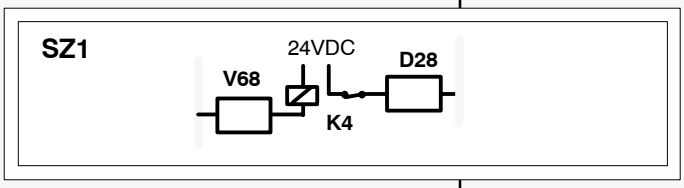
0203
Tomo en x relay active

Check relay **K3** on **SZ1**
only used in the starting phase







0204
Tomo test relay dead

Check relay **K4** on **SZ1**
relay does not switch over

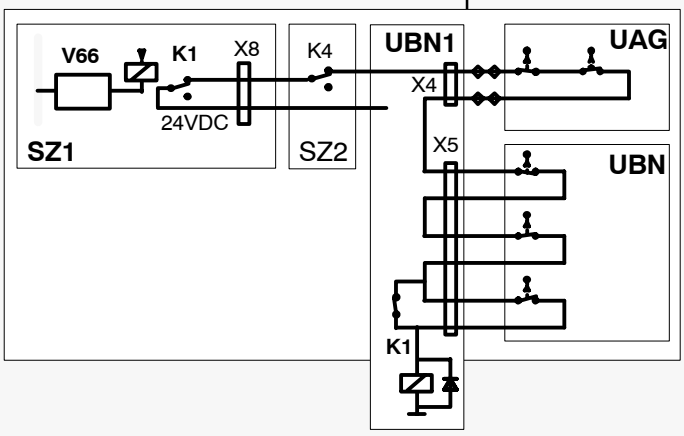
0205
Tomo reg dev changed

During a tomo run another
RGDV was selected

0206

0207
Tomo safety relay opened

Check relay **K1** on **SZ1**



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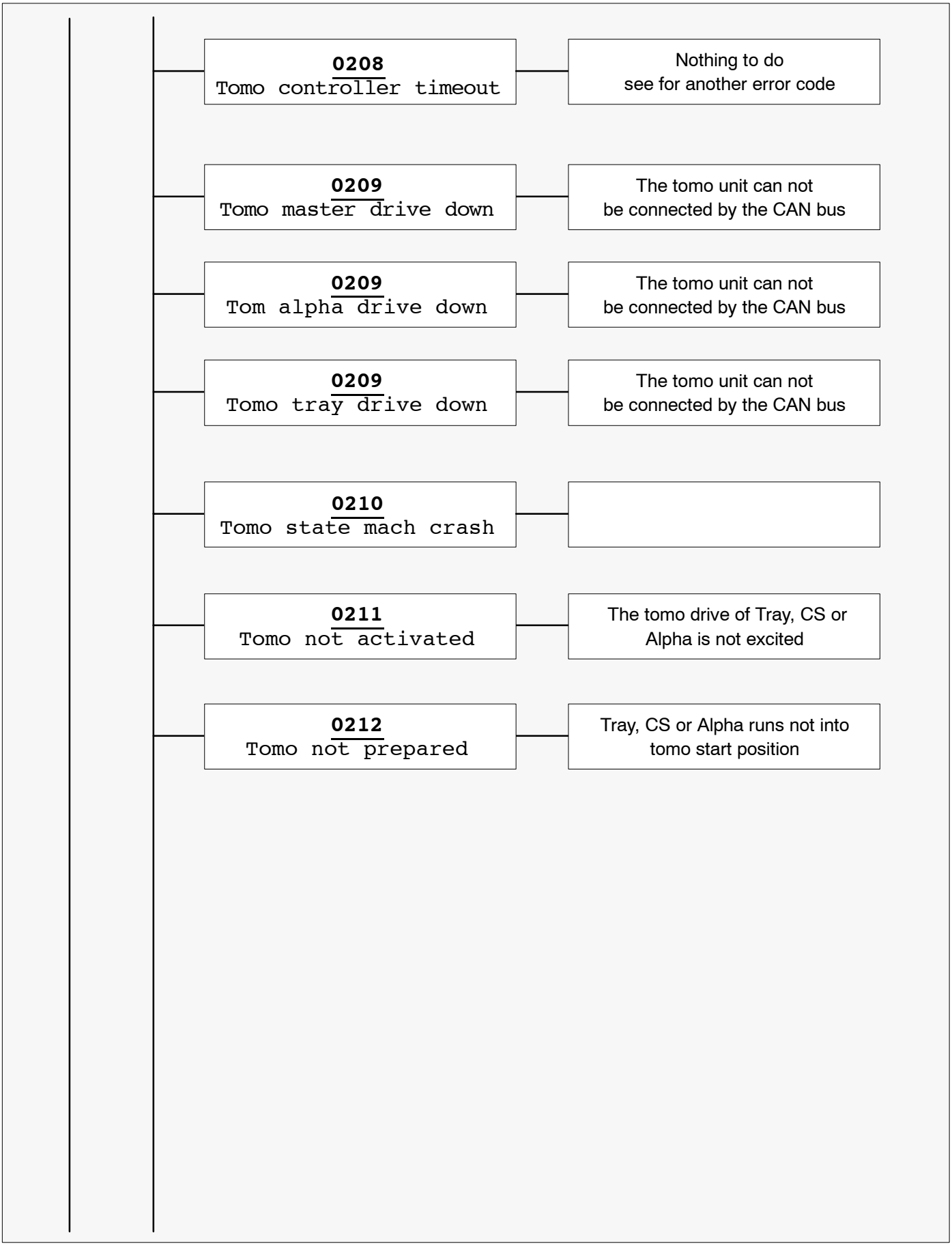

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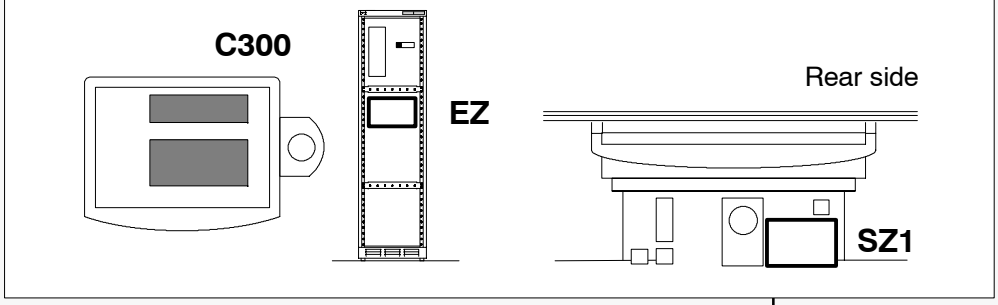
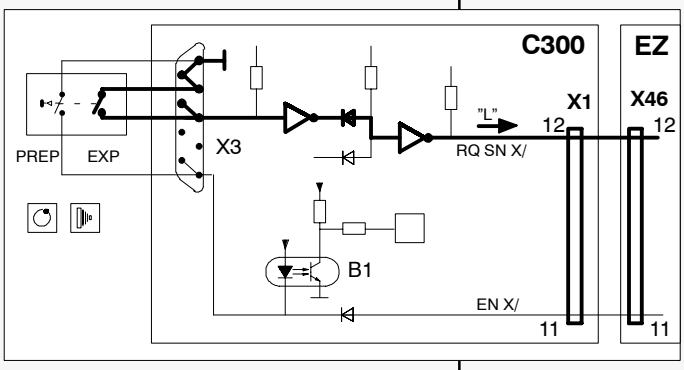
0213
Tomo xrg stopped run

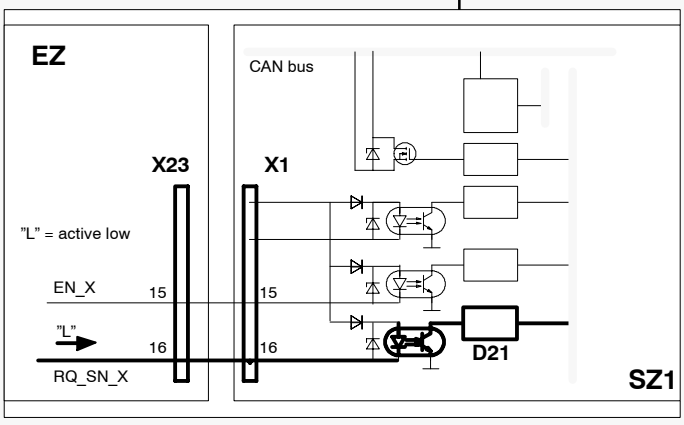
The exposure release switch was not depressed over full exposure time

0214
Tomo expbut2 not pressed

See INFO
<I > RQ_SN_X: ON/OFF







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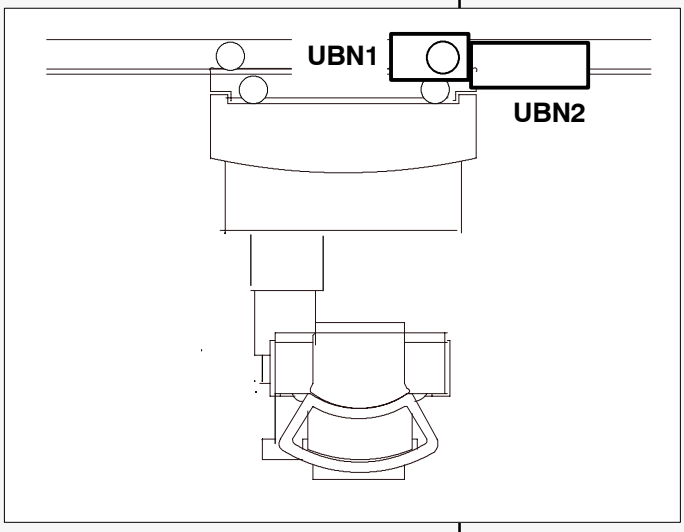
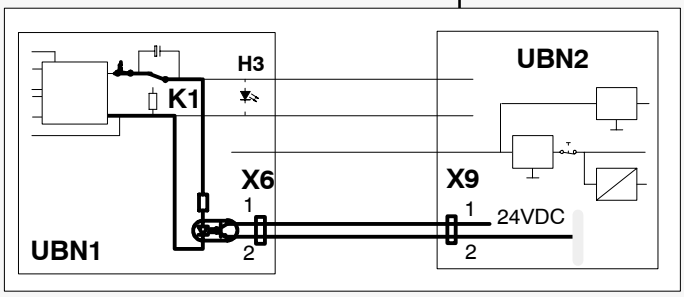
0215
Tomo safety relay stuck

The state of the tomo safety relay **UBN1 K1** was not recognuized.
LED **H3** = OFF -> replace **UBN1**
LED **H3** = ON -> replace **UBN2**

Service tip
Check cable connection
UBN1 X6 - UBN2 X9





0216
Tomo run abort unknown

0217
Tomo run aborted

0218
Tomo controller crash

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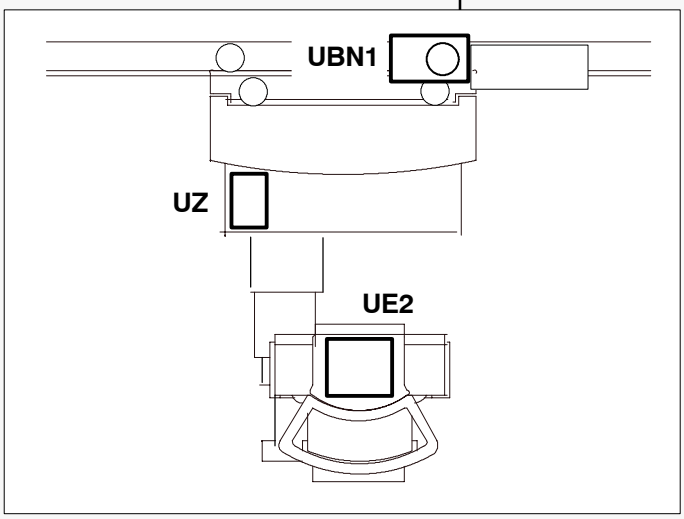
0219
Tomo servo relay stuck

The active relay **UE2 K1** is recognized by the bucky controller software, but the function of the relay is not dialed yet, replace **UE2**, check cable connection **UE2 X2** – **UZ X7** – **UZ X24** – **UBN1 X4**



0220
Tomo table top move

Check switches **S1** for tomo center position of the table

0221 ... 0228

See documentation of EasyDiagnost

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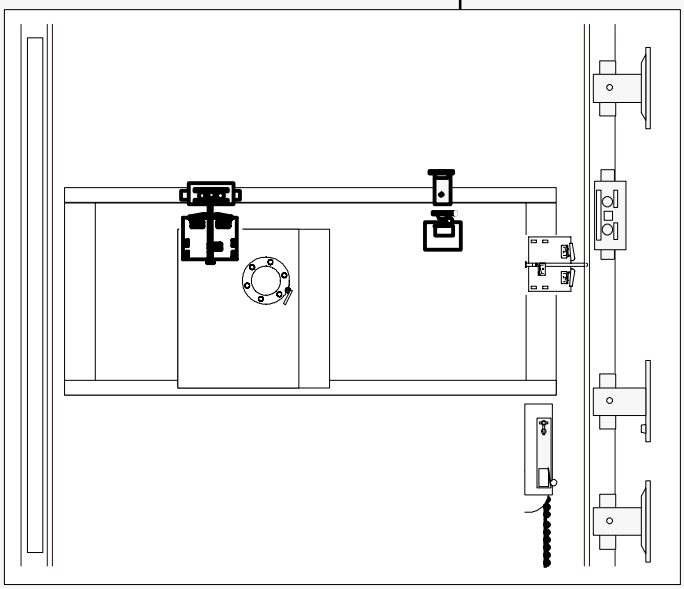
0250
Tomo cs trans not def

A position switch or height sensor has caused an unexpected function during a tomo run,
check height sensor and switches, respect their thresholds



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0251
Tomo cs hght not def

A position switch or height sensor has caused an unexpected function during a tomo run,
check height sensor and switches, respect their thresholds,
this error code is possible only if a **manual collimator** is installed.

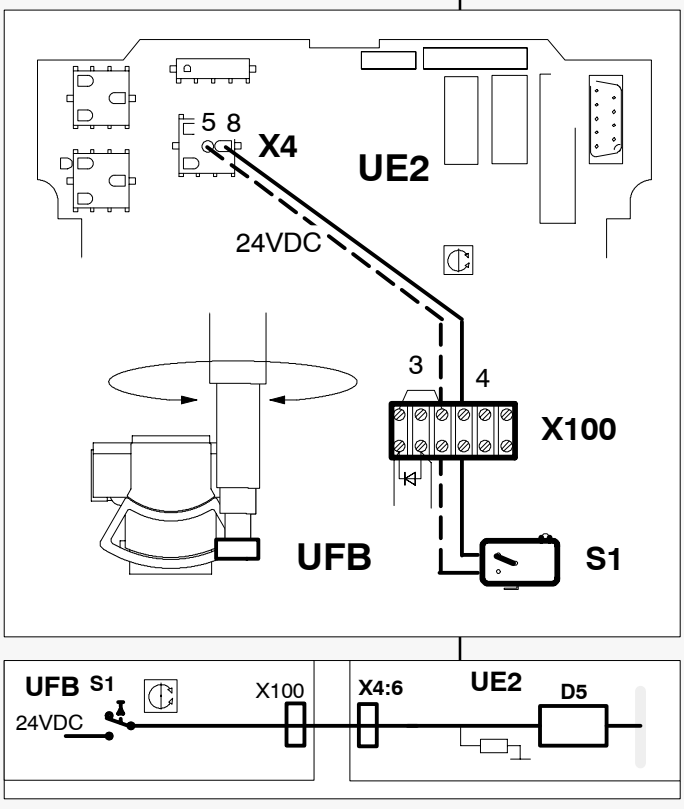
0252
Tomo cs hght too low

0253
Tomo cs hght too high

A position switch or height sensor has caused an unexpected function during a tomo run,
check height sensor and switches, respect their thresholds,
this error code is possible only if a **automatic collimator** is installed.

0254
Tomo cs beta not def

Check switch **UFB S1** respect their threshold



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4. Error Code 0300 ... 0304 bucky Controller & Service Data

0255
Tomo tbl hght too low

0256
Tomo tbl hght too high

A position switch or height sensor of the table has caused an unexpected function during a tomo run, check height sensor and switches, respect their thresholds

0257
Tomo cs beta not def

See documentation of a Diagnost 77 system

0258
Tomo cs beta not def

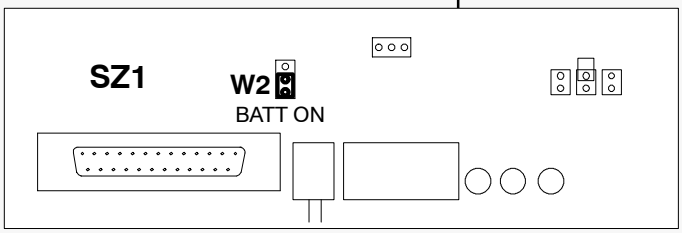
See documentation of a Diagnost 77 system

0300 ... 0304
bucky Controller, Service Data

Xscope Configure with program X-Scope

0300
Error log init

The bucky controller firmware was changed, the battery is not connected **W2** or **SZ1** defect



0301
Servicedata init

RAMs are overwrited (0300)

0302
Servicedata special

After upgrading with firmware ≥2.1 the system recalibrates the tray

0303
Servicedata param

See documentation of a Diagnost 77 system

0304
Servicedata unconfig

Xscope Configure with program X-Scope

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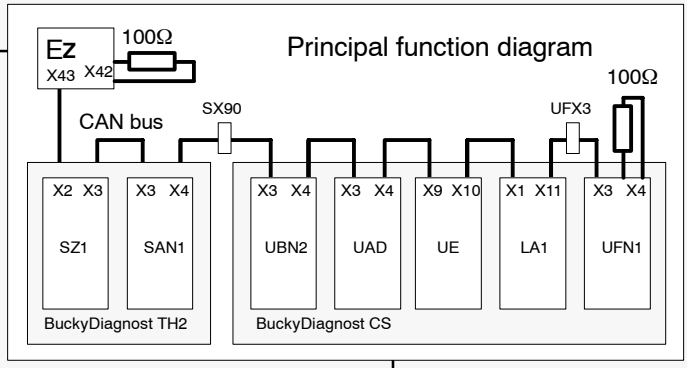
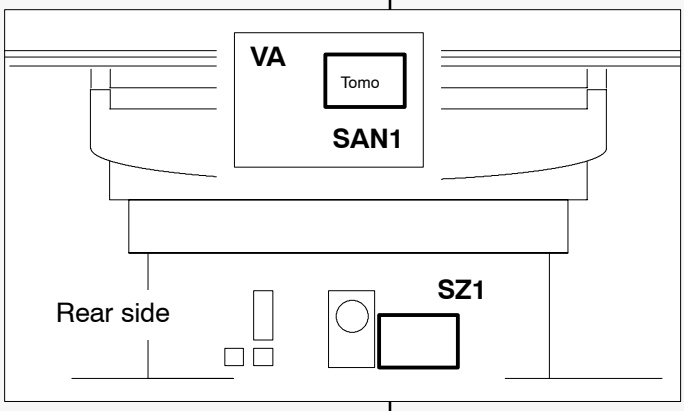
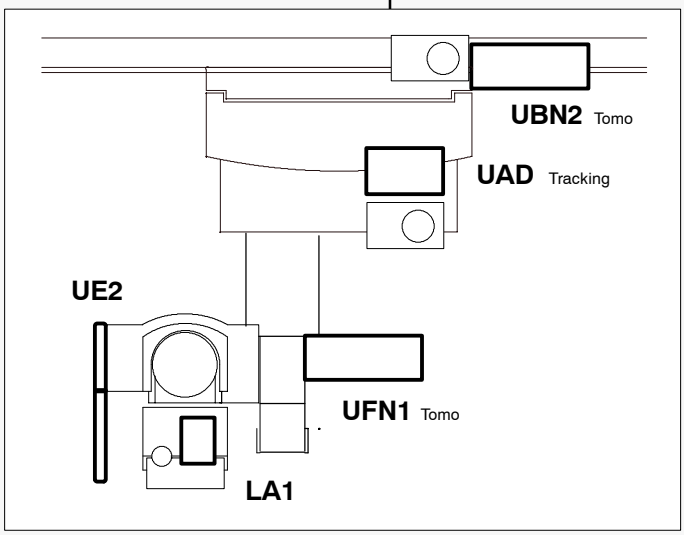
5. Error Code 0400 ... 0416 CAN Bus

0400 ... 0416
CAN Bus







0400 CAN node disconnect	Check cable connection of the CAN bus
0401 CAN node start fail	Check components of the CAN system
0402 CAN node guarding fail	???

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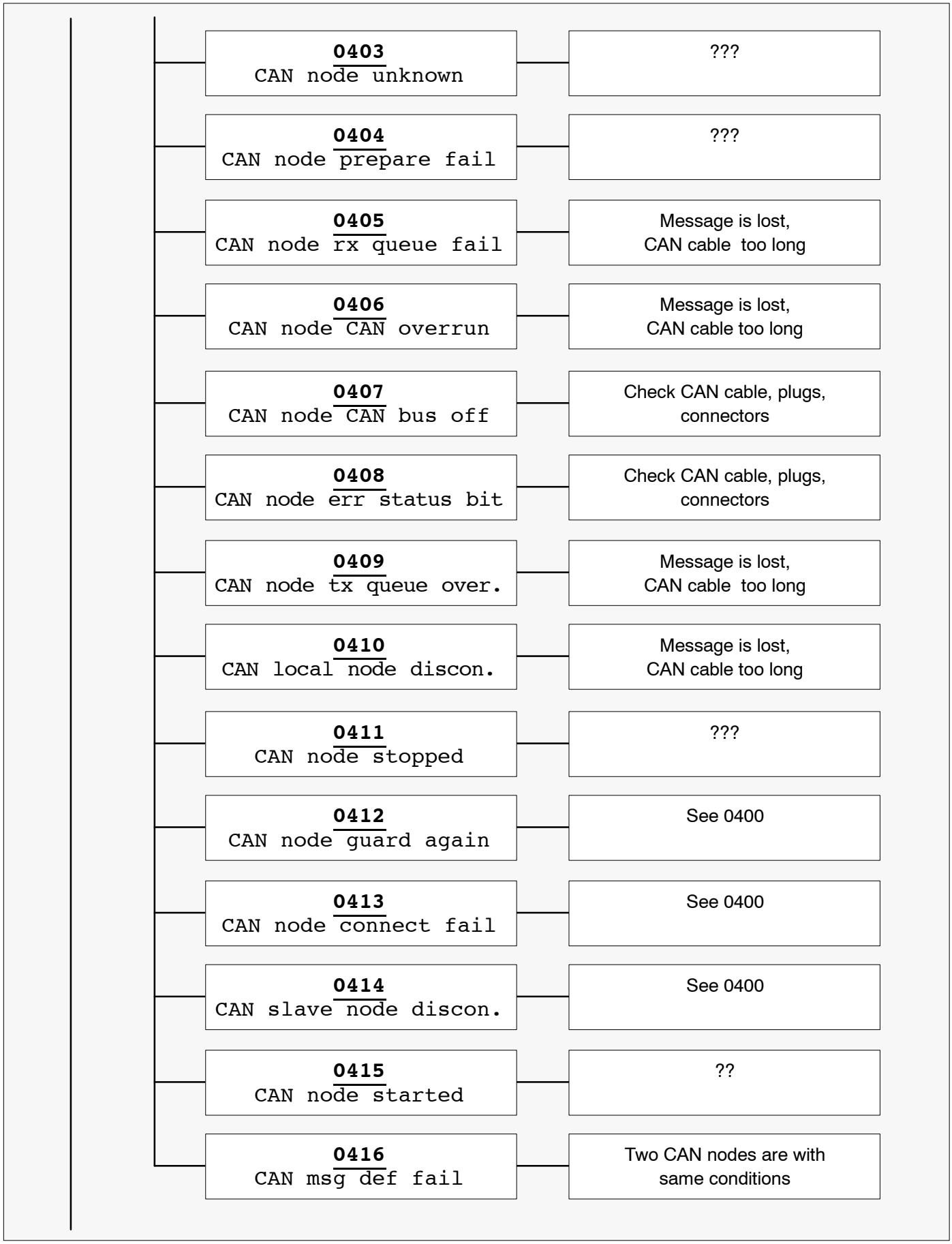

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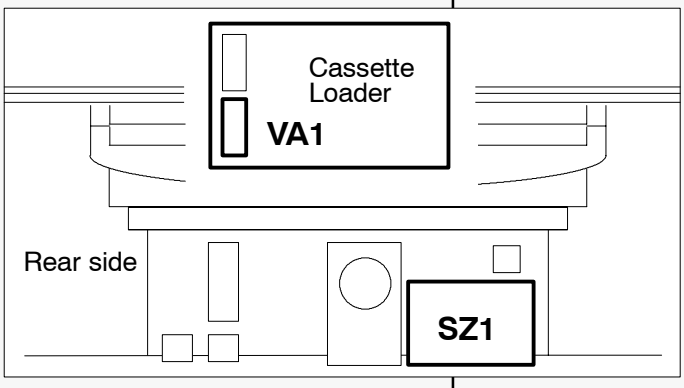
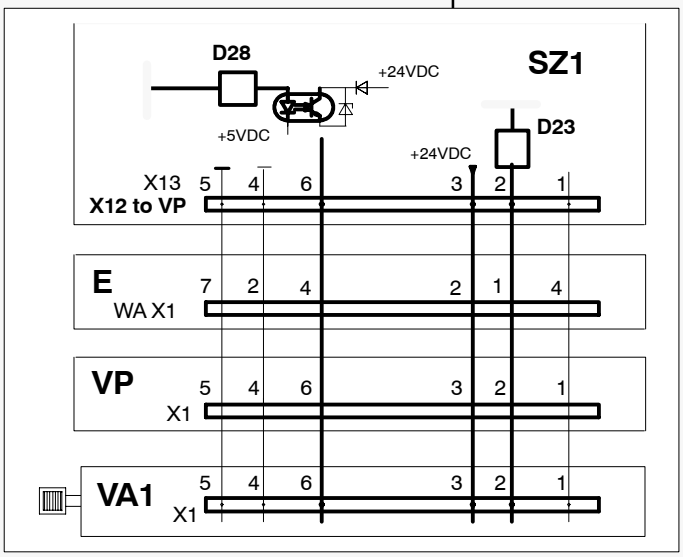
6. Error Code 0700 ... 0712 System

0700 ... 0712
System

0700 Sys invalid reg device	Configure the generator
0701 Sys reg device not2rooms	The generator select RGDV 4 ...7 but bucky controller selects 0 ... 3
0702 Sys sid invalid	The SID is not calculatable
0703 Sys raster not released	The sequence of the grid start and the timer fails, check mechanical function of the grid check cable connections, adjust the delay time





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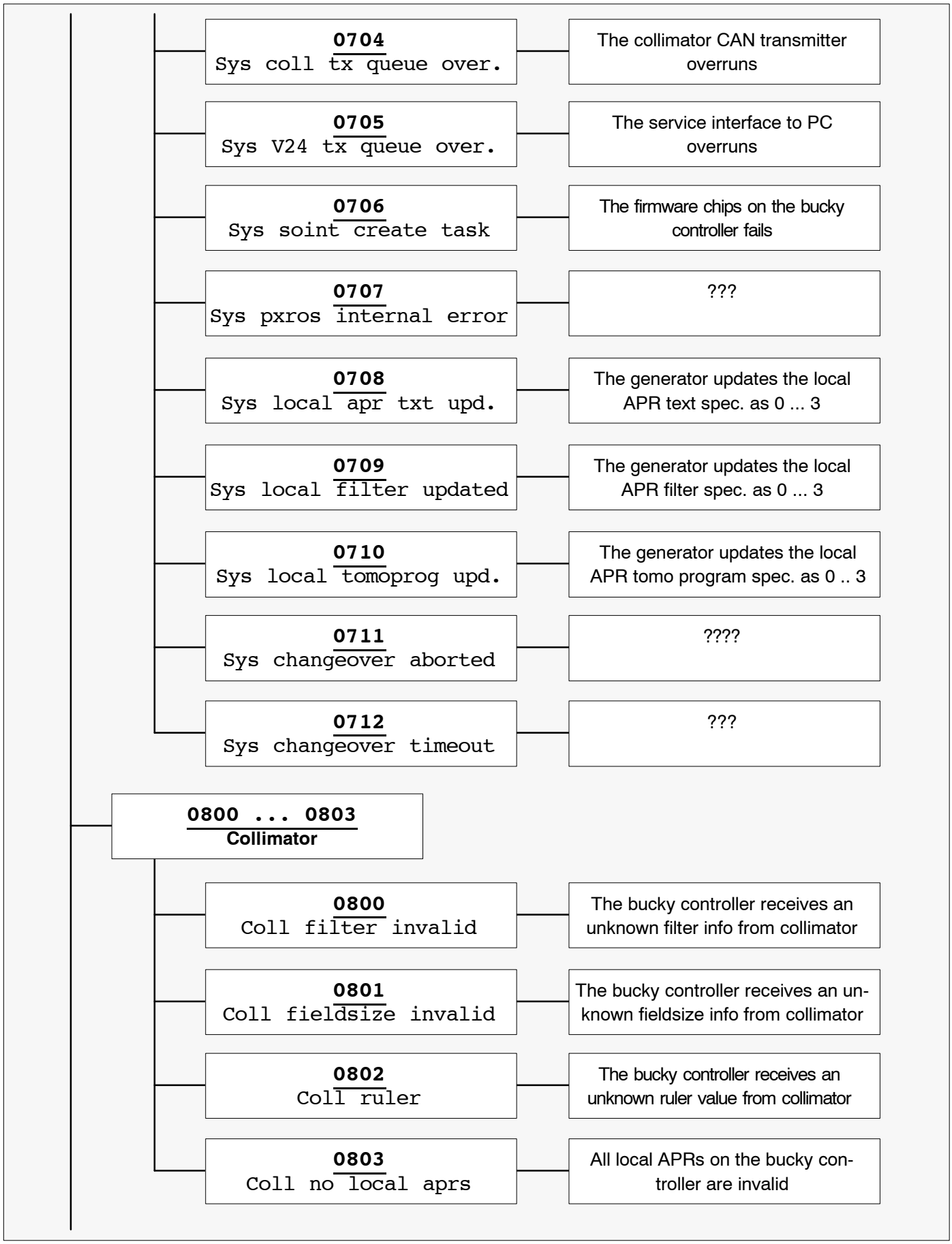
7. Error Code 0800 ... 0803 Collimator


0704
Sys coll tx queue over.
The collimator CAN transmitter overruns
0705
Sys V24 tx queue over.
The service interface to PC overruns
0706
Sys soint create task
The firmware chips on the bucky controller fails
0707
Sys pxros internal error
???
0708
Sys local apr txt upd.
The generator updates the local APR text spec. as 0 ... 3
0709
Sys local filter updated
The generator updates the local APR filter spec. as 0 ... 3
0710
Sys local tomoprog upd.
The generator updates the local APR tomo program spec. as 0 .. 3
0711
Sys changeover aborted
????
0712
Sys changeover timeout
???
0800 ... 0803
Collimator
0800
Coll filter invalid
The bucky controller receives an unknown filter info from collimator
0801
Coll fieldsize invalid
The bucky controller receives an unknown fieldsize info from collimator
0802
Coll ruler
The bucky controller receives an unknown ruler value from collimator
0803
Coll no local aprs
All local APRs on the bucky controller are invalid

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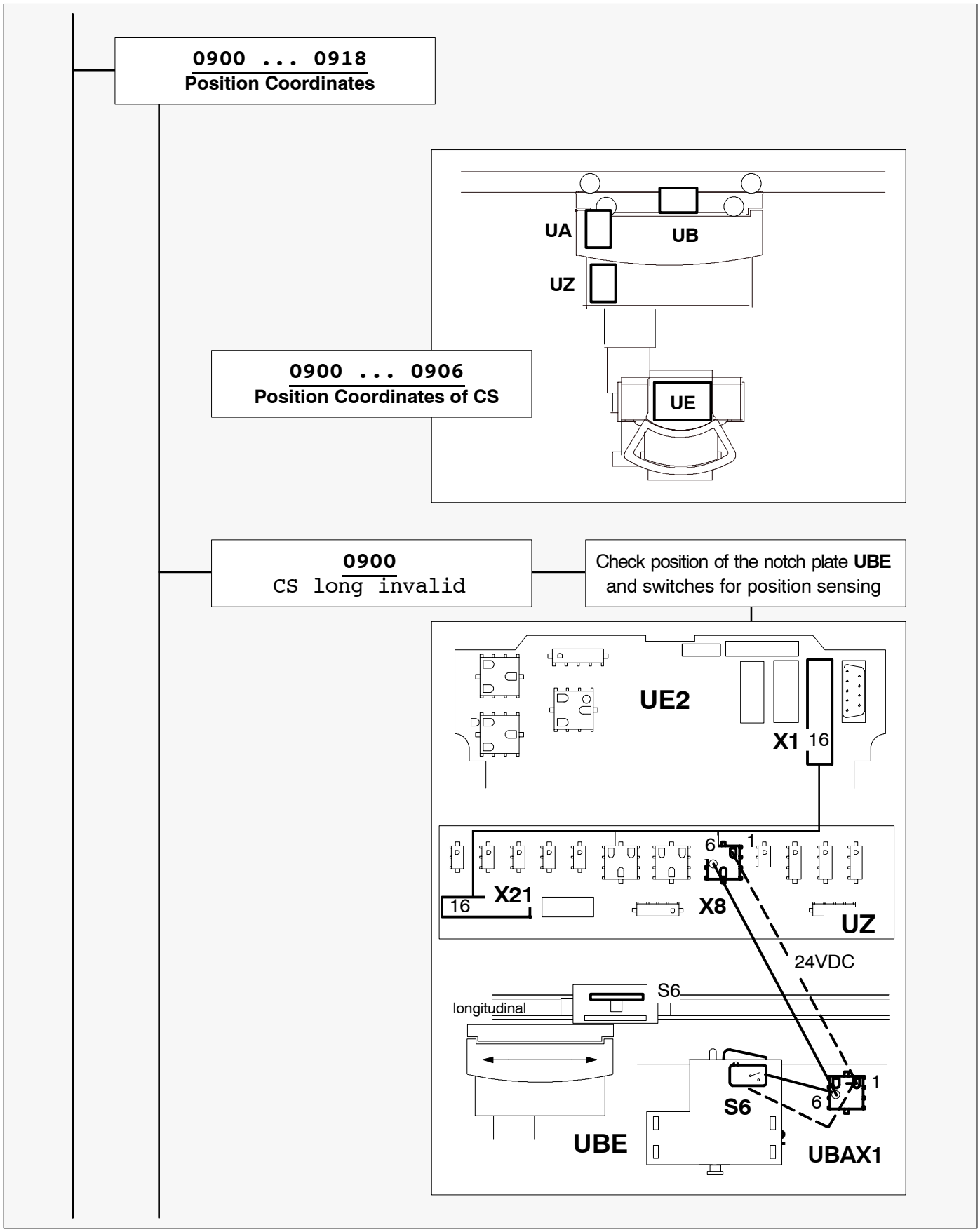
8. Error Code 0900 ... 0918 Position Coordinates

8.1. Error Code 0900 ... 0906 CS



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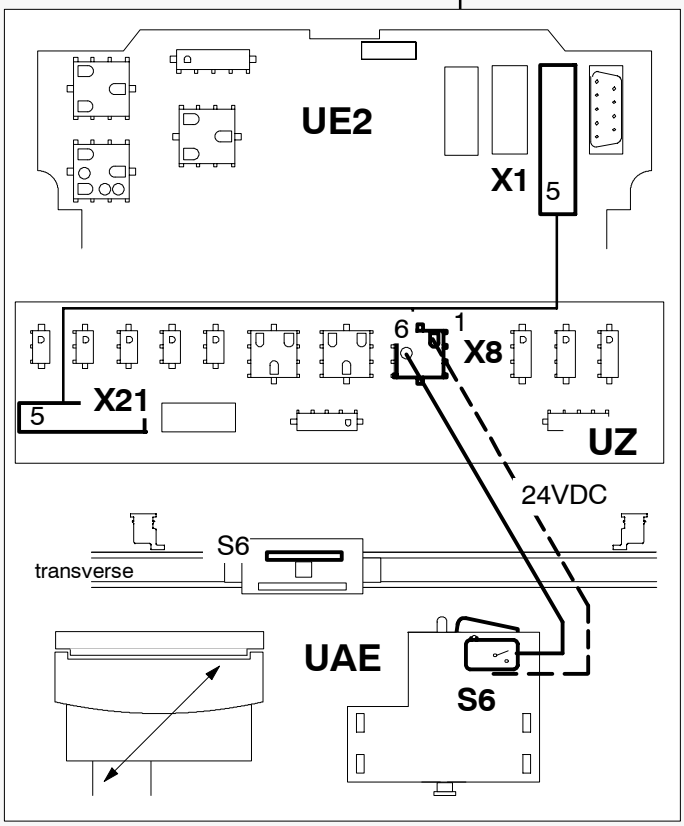
0901
CS trans invalid

Check position of the notch plate **UAE** and switches for position sensing

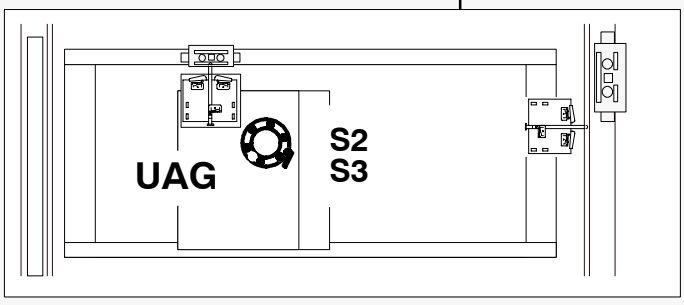


0902
CS hght def invalid

Xscope Check adjustment of tomography with program X-Scope

0903
CS tomo hght mismatch

Xscope Check adjustment of tomography with program X-Scope



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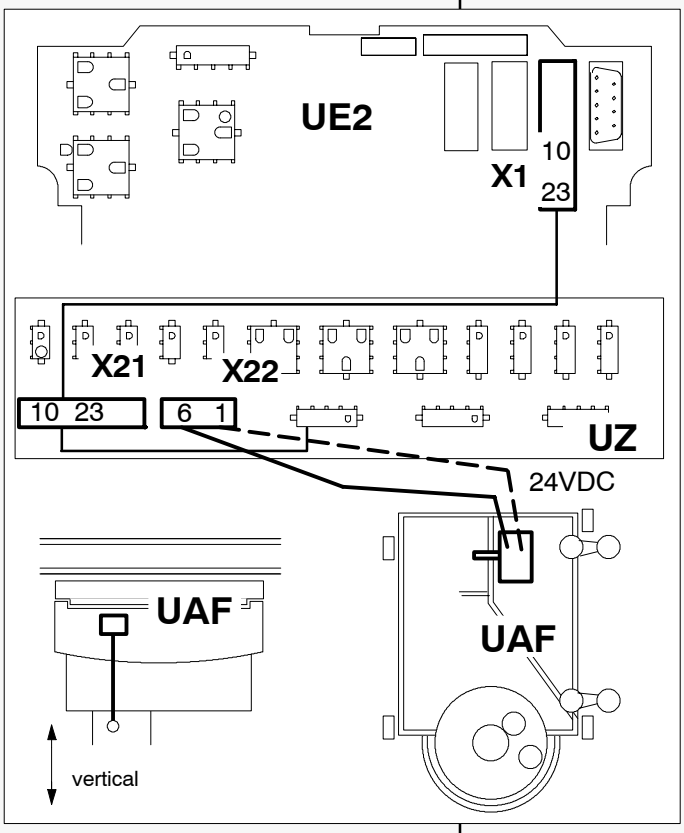
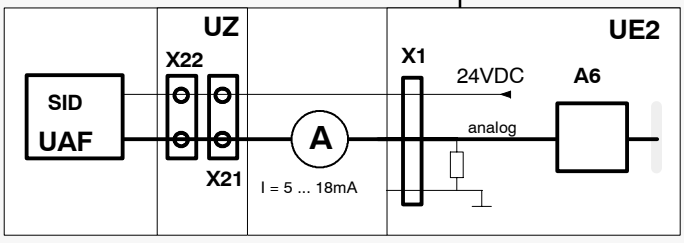
0904
CS hght invalid

0905
CS hght sens short cct

0906
CS hght sens open cct

Check SID sensor **UAF** for SID measuring





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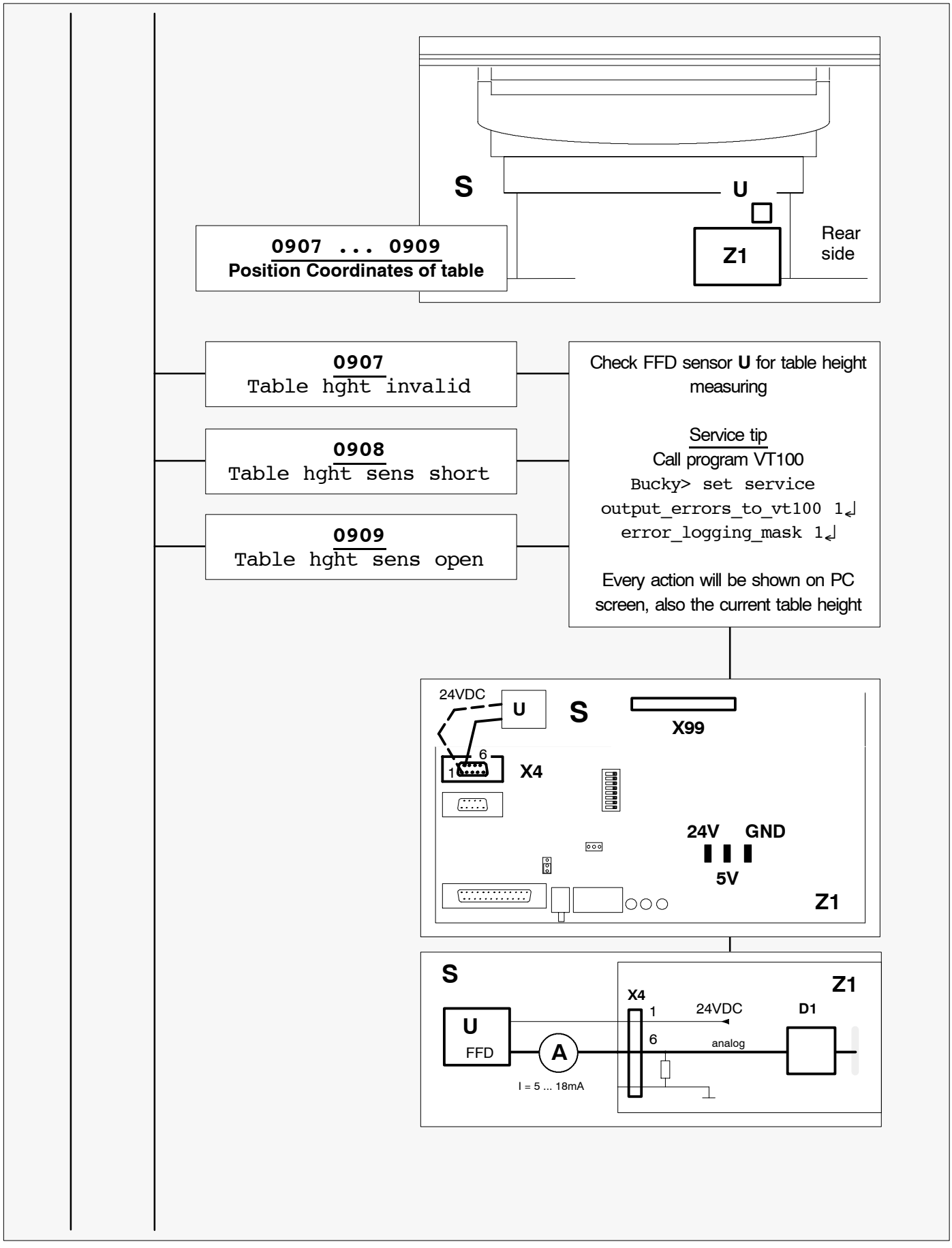
8.2. Error Code 0907 ... 0909 Table



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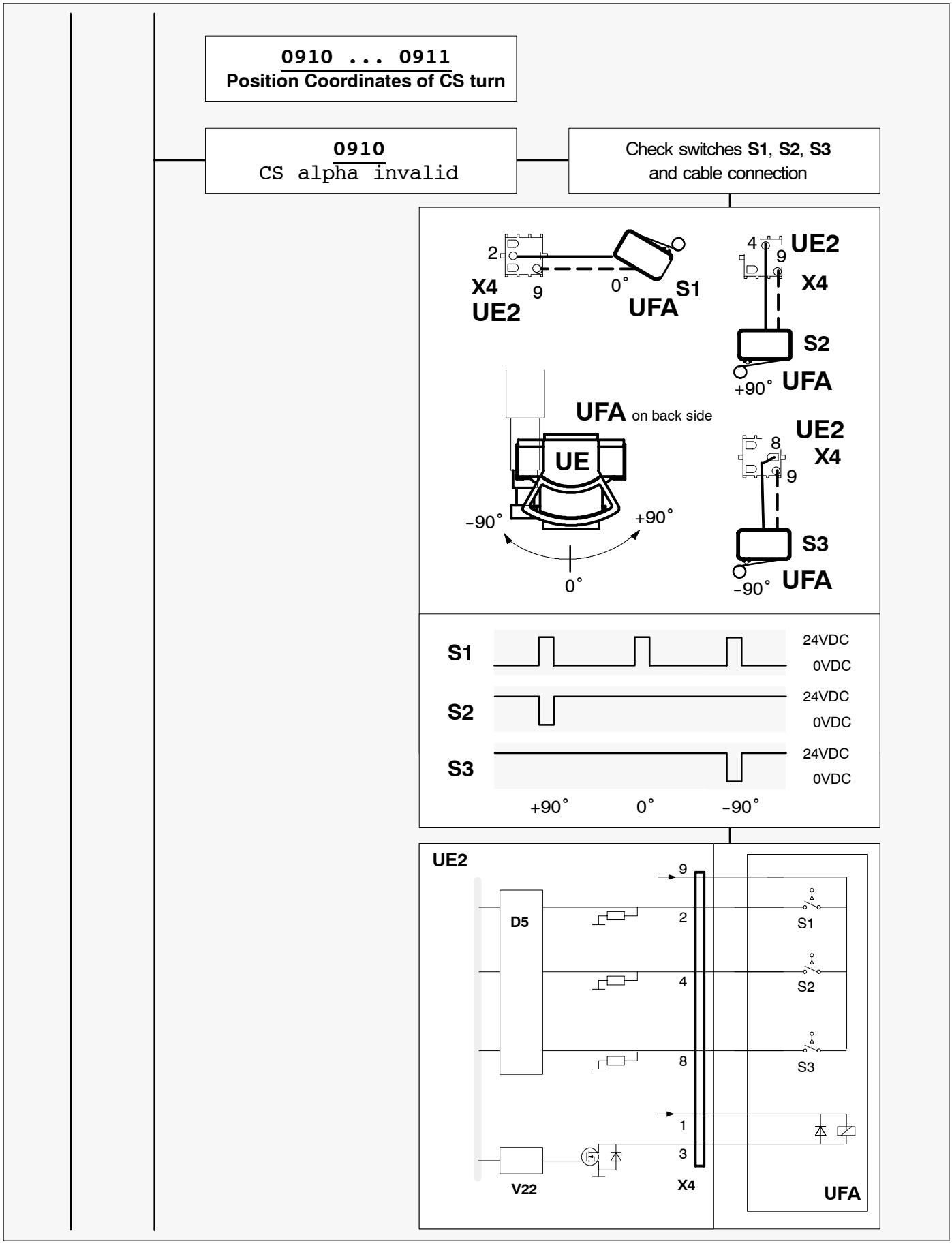
8.3. Error Code 0910 ... 0911 CS alpha & beta



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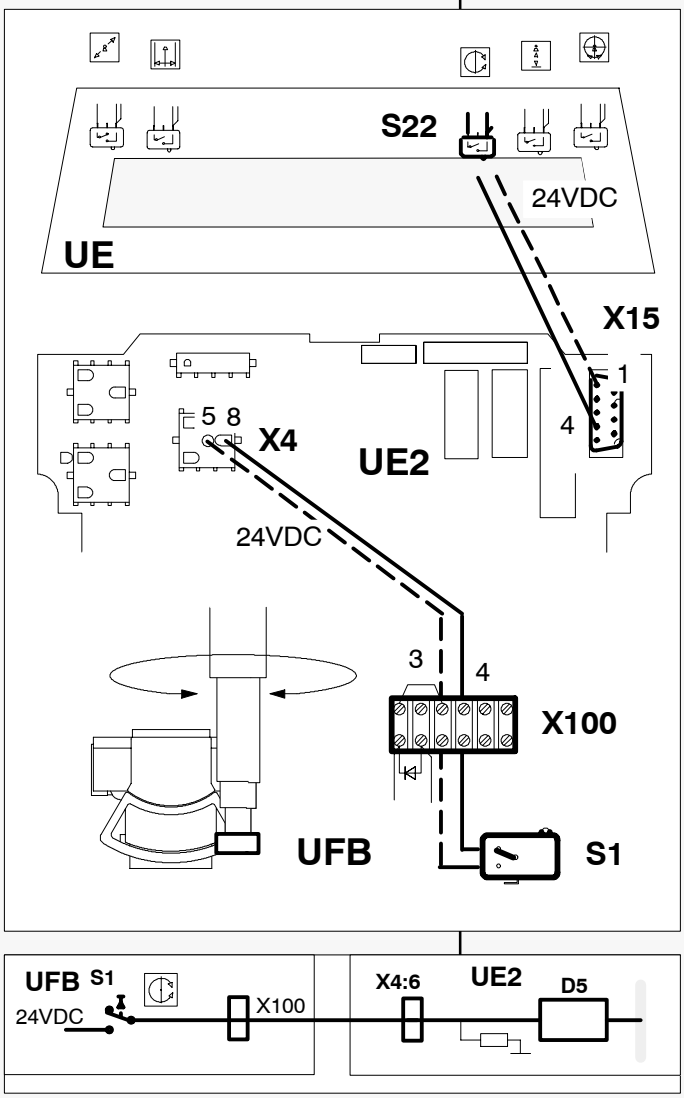
0911
CS beta invalid

Check switch **S1**
and cable connection



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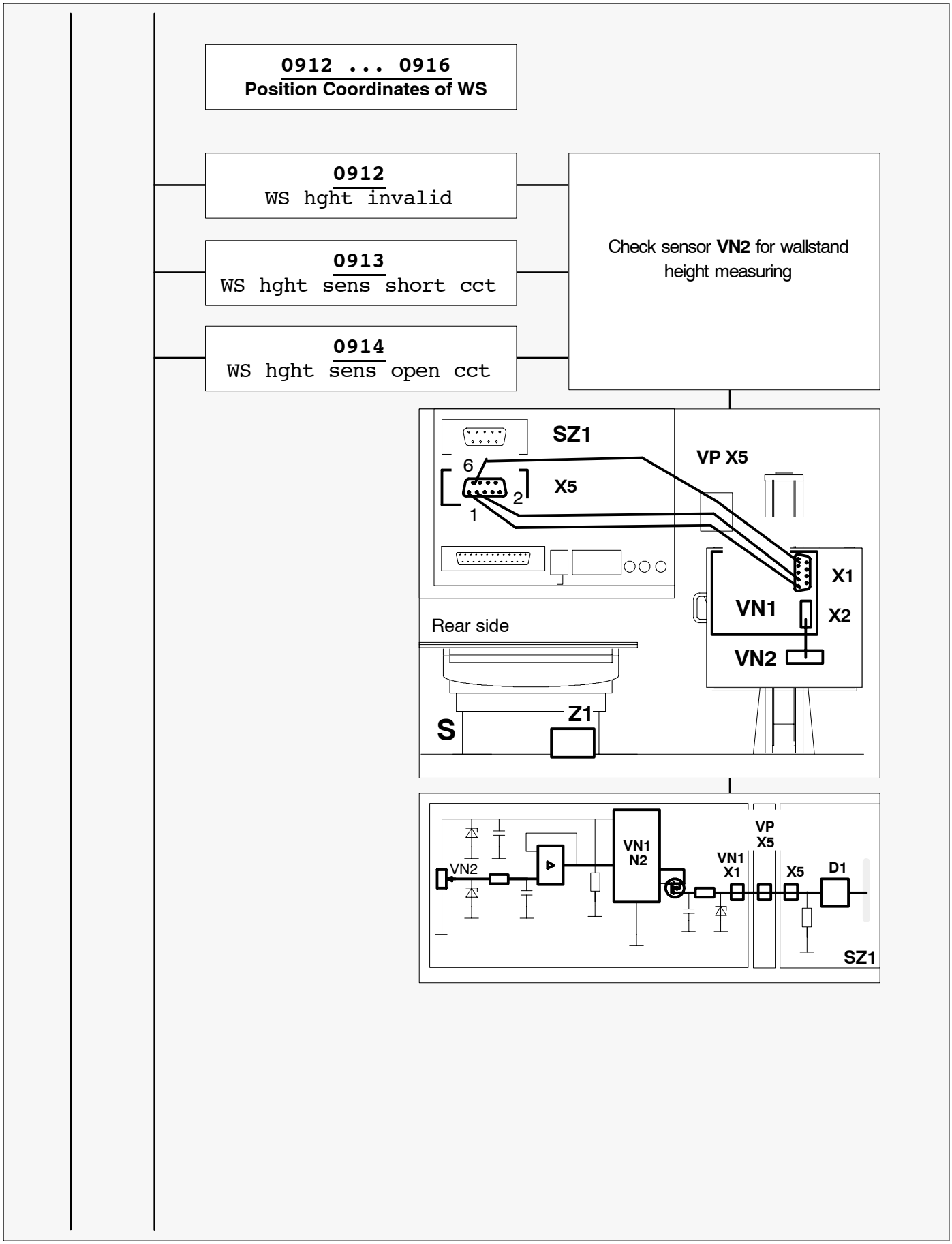
8.4. Error Code 0912 ... 0916 Wallstand



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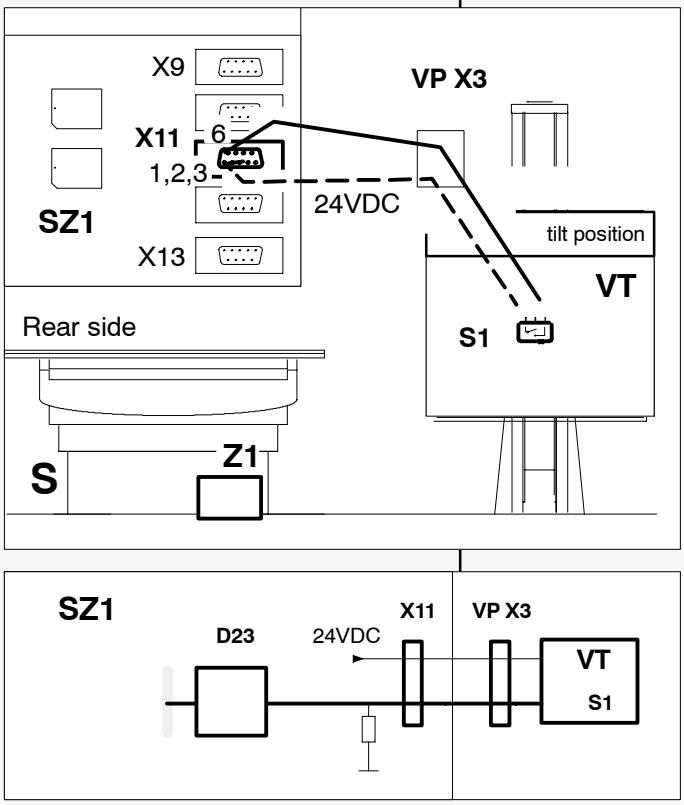
0915
WS hght mismatch

The height position switch **S1** must be adjusted so that the tilted bucky unit is on the same height as the bucky of the bucky table



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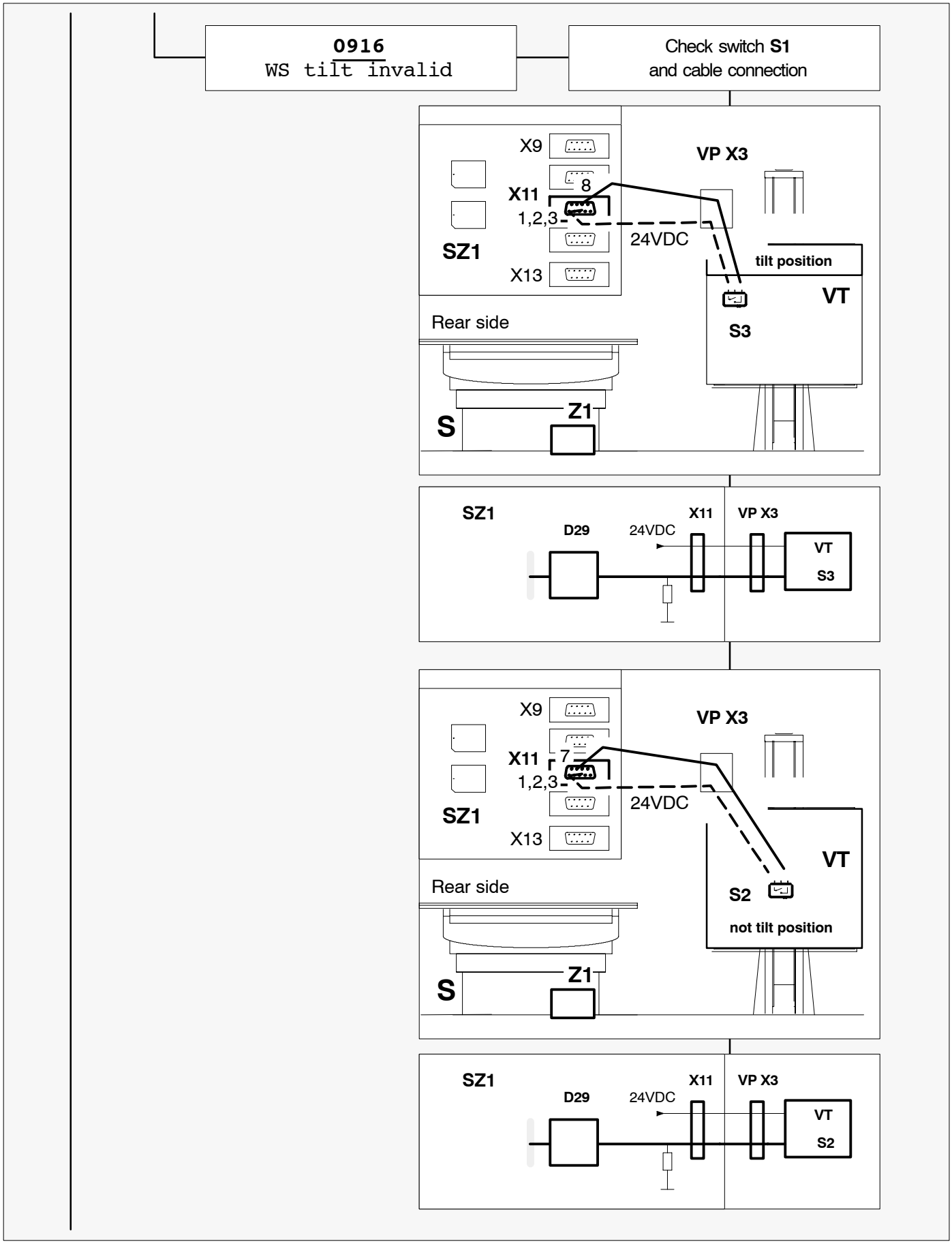

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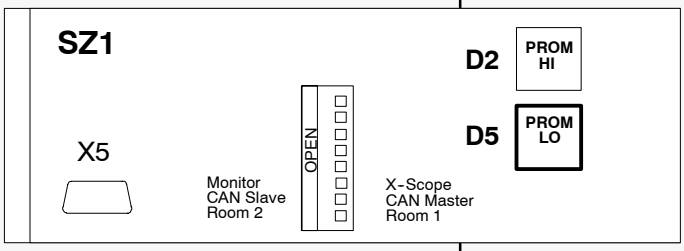
9. Error Code 1000 ... 1019 bucky Controller & Selftest

1000 ... 1019
bucky Controller, Self Test

1000 Bst watchdog	Replace the bucky controller **SZ1**
1001 Bst ram	The power-up RAM test fails
1002 Bst eprom low byte	Replace the EPROM **D5**
1003 Bst eprom high byte	Replace the EPROM **D2**
1004 Bst uart	Replace the bucky controller **SZ1**, the V24 port fails
1005 Bst CAN controller	Replace the bucky controller **SZ1**
1006 Bst corrupt error log	Replace the bucky controller **SZ1**
1007 Bst servicedata upgrade	Xscope Configure system with program X-Scope
1008 Bst servicedata downgr.	Xscope Configure system with program X-Scope



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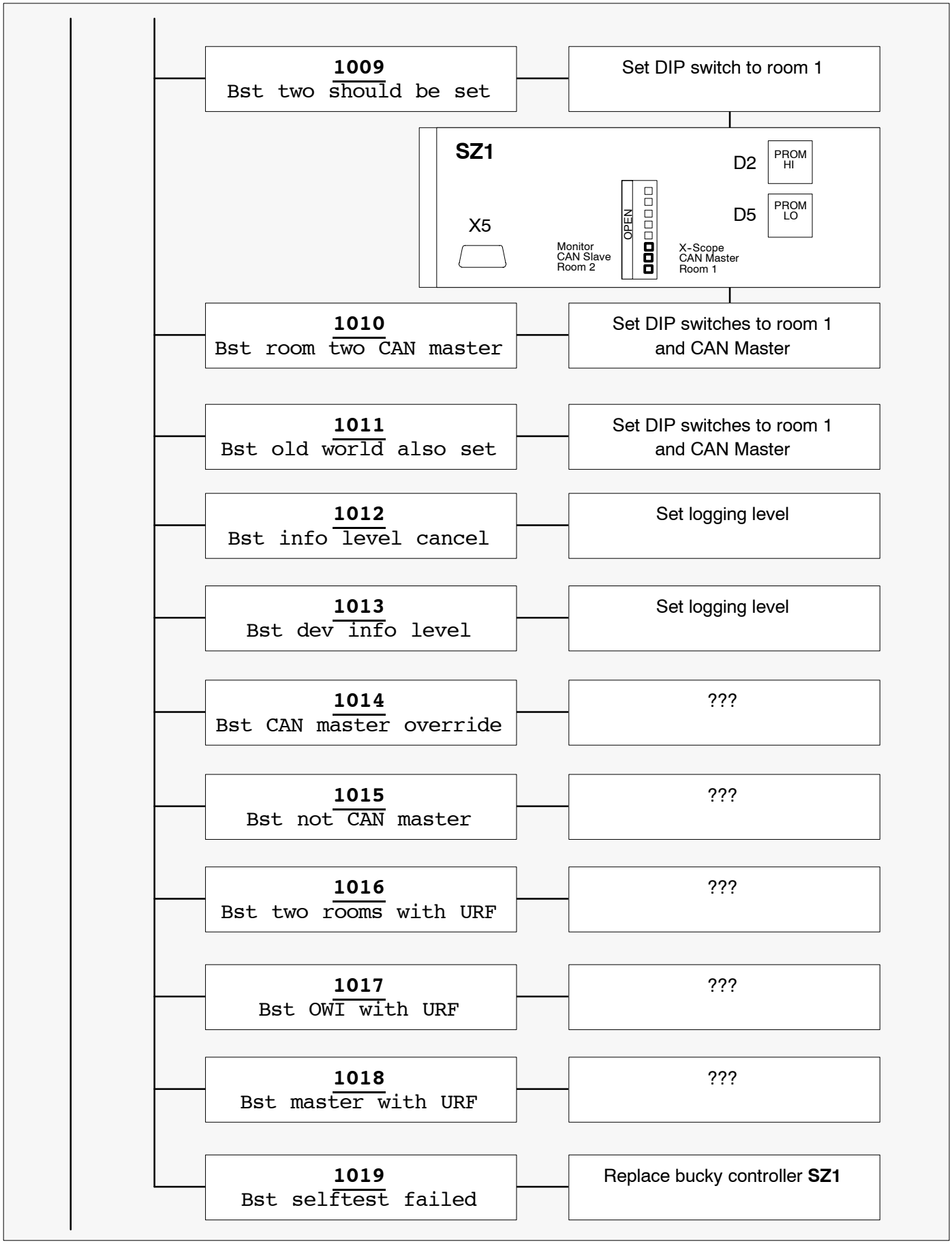

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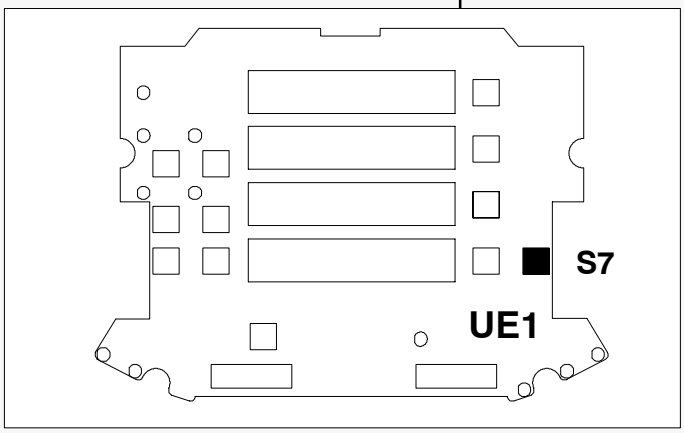
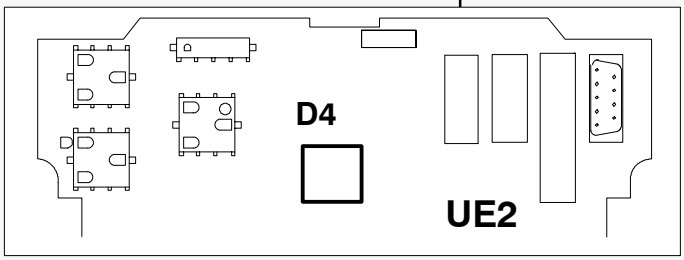
10. Error Code 1100 ... 1106 Control Handle

1100 ... 1106
Control Handle

1100 CH general	A unknown control handle is connected
1101 CH test relay stuck	The relais on the control handle fails, replace board **UE1** or **UE2**



1102 CH test watchdog	Nothing to do
1103 CH test key stuck	Replace switch **S7** on board **UE1**
1104 CH test RAM	The RAMs on board **UE2** fail, replace board
1105 CH test EPROM	Replace EPROM **D4** on board **UE2**



1106 CH test CAN	The CAN controller on board **UE2** fails, replace board

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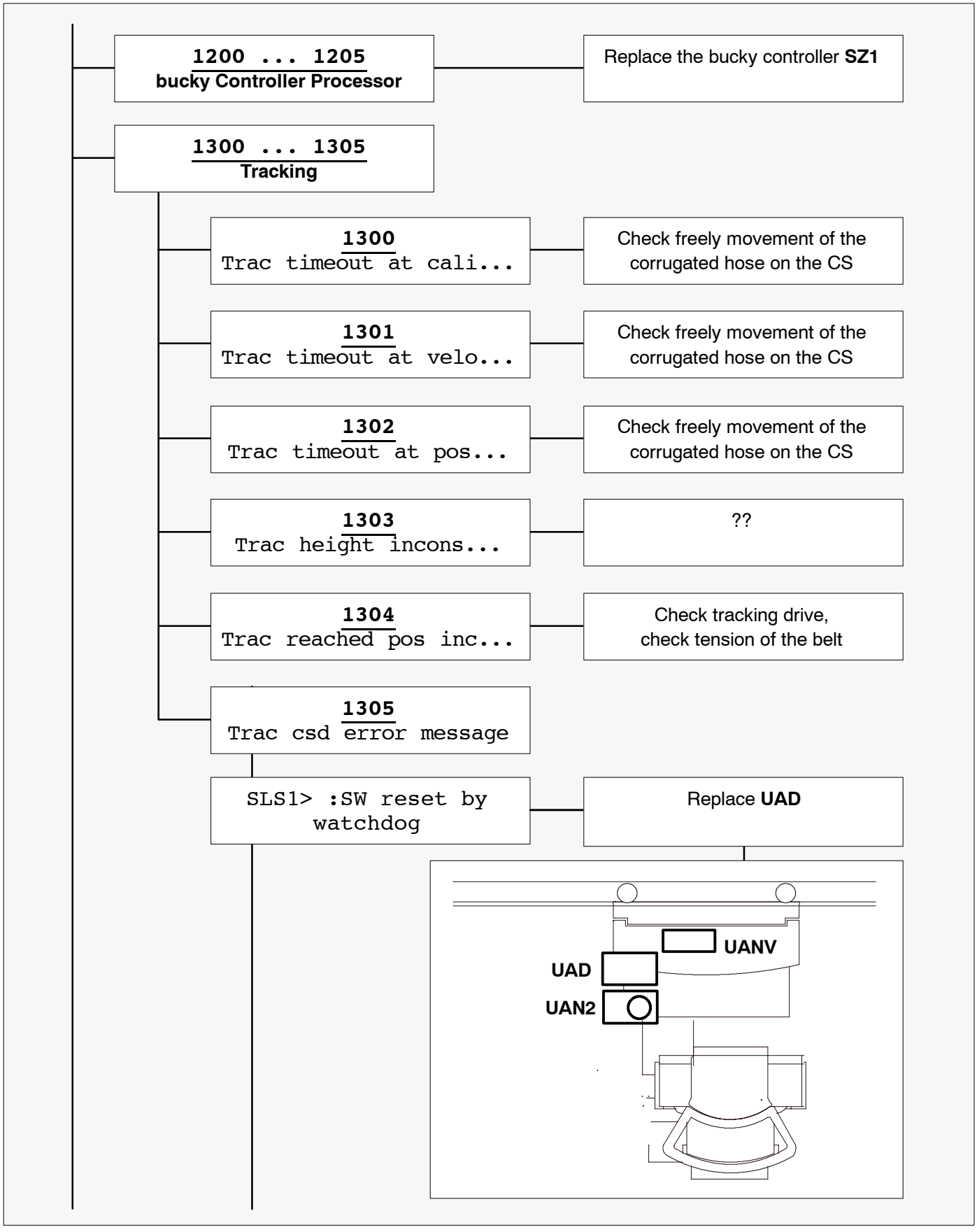
11. Error Code 1200 ... 1205 bucky Controller Processor

12. Error Code 1300 ... 1305 Tracking



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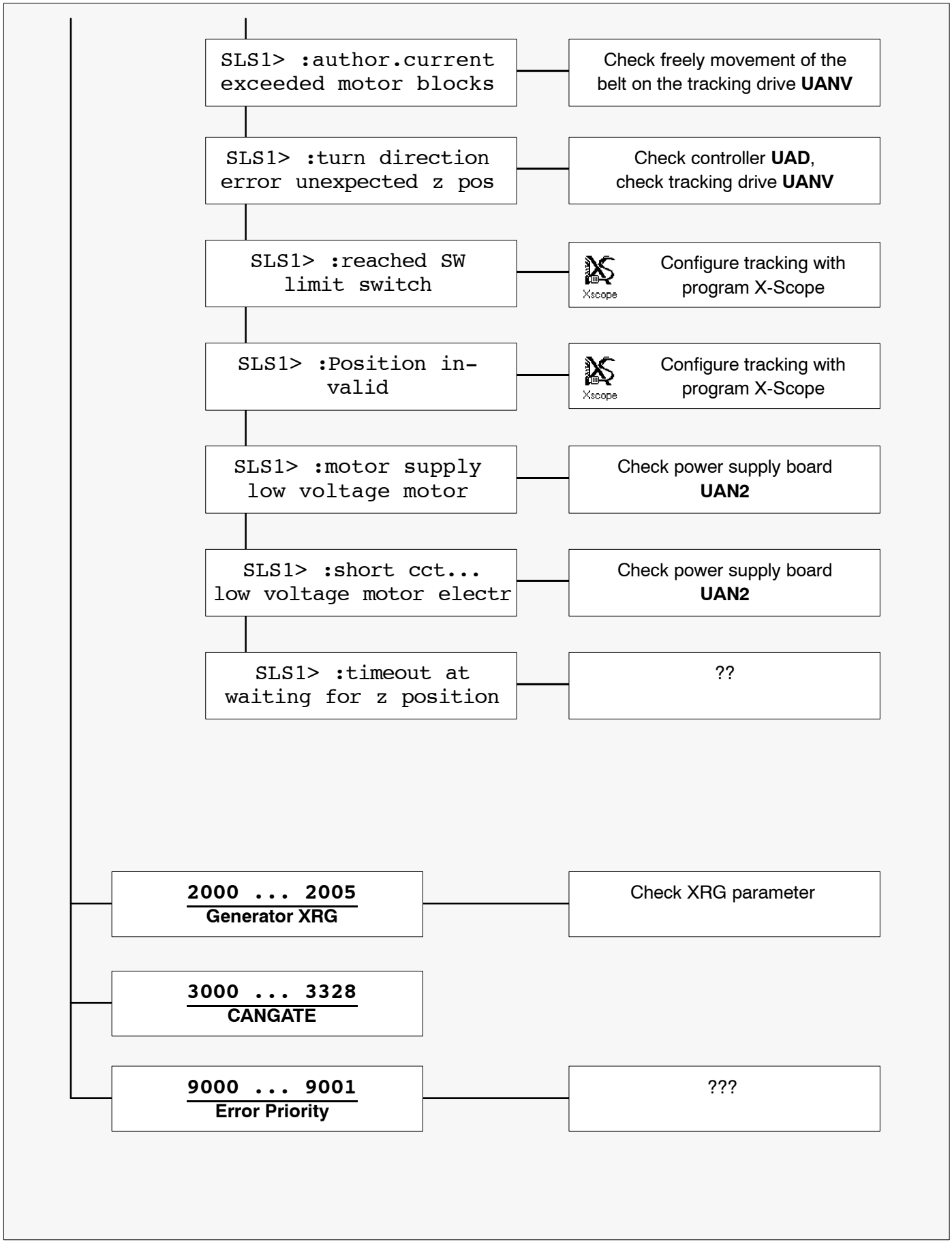
SLS1> :author.current exceeded motor blocks
Check freely movement of the belt on the tracking drive **UANV**
SLS1> :turn direction error unexpected z pos
Check controller **UAD**, check tracking drive **UANV**
SLS1> :reached SW limit switch
Xscope
Configure tracking with program X-Scope
SLS1> :Position in-valid
Xscope
Configure tracking with program X-Scope
SLS1> :motor supply low voltage motor
Check power supply board **UAN2**
SLS1> :short cct... low voltage motor electr
Check power supply board **UAN2**
SLS1> :timeout at waiting for z position
??
2000 ... 2005
Generator XRG
Check XRG parameter
3000 ... 3328
CANGATE
9000 ... 9001
Error Priority
???

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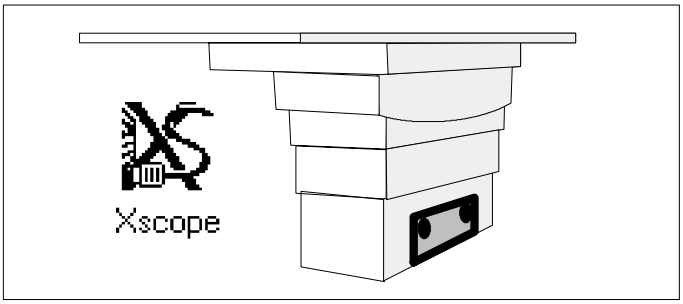
13. Faultfinding with Program VT100

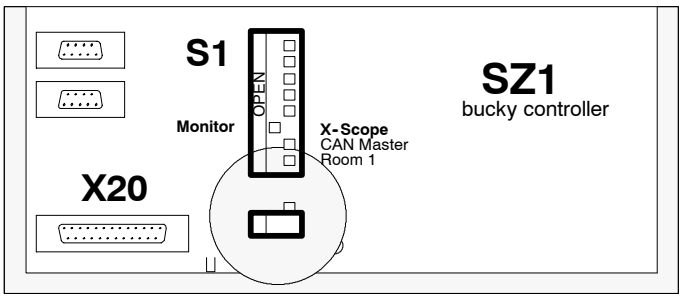
13.1. Preparation



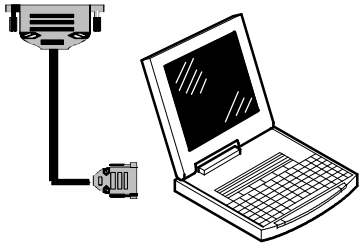
- Switch **ON** the system
- Raise the table top to its uppermost position.

- Switch **OFF** the system
- Unscrew the service-cover at the rear side, open it.

13.2. Hardware Programming



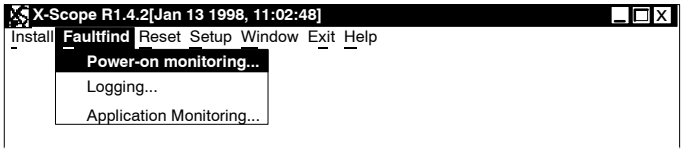
- Set DIP of **S1** to position **Monitor**
  (= VT100 monitor) as shown in the figure.
- Connect data line from the connector X20 to the PC port COM1. Another port cannot be used.



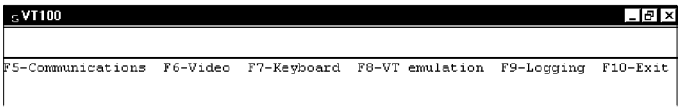
- Switch **ON** the PC
- Call program MS Windows
- Call program X-Scope

If the program is not on PC, install it as written, see installation card.

13.3. Faultfinding



- Call program X-Scope
- Follow the instructions on screen
- Select *Faultfind*
- Select *Power-on monitoring...*
- Press *Enter* key



The window of VT100 will appear.
If not, change to it by pressing the keys *Alt* & *Tab*.
The program VT100 is enabled now.

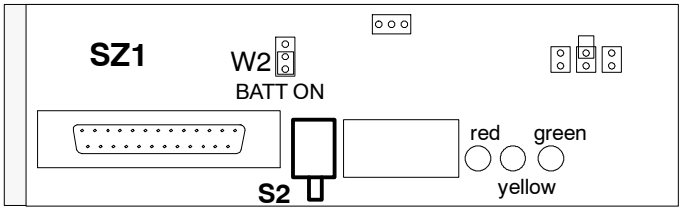
- Press *Enter* key

The prompt `Bucky>` will appear. If not, check the data line.

To activate the bucky controller selftest

- Press reset button **S2** on the bucky controller **SZ1**

or



- Switch **ON** the system again

The selftest informations will be displayed. The red LED on the bucky controller **SZ1** will be ON during selftest run or in error conditions.

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13.4. Commands

13.4.1. Superuser

The command `superuser` gives full eccess of all VT100 commands.

- To activate, type `superuser`↵

If the bucky controller was switched off, e.g. the system was switched off, the command must be typed renewed.

13.4.2. Help

- Type `help`↵

A list of order specifications will be listed.

```
Bucky> help
show
   analogue - show raw analogue input values
   fieldsize- show collimated fieldsize
*  mem      - show memory contents
   service  - show the value of a service variable
*  var      - show value & mode of a system i/o variable
*  disp     - show control handle display string
set
   service  - set the value of a service variable
*  mem      - store data to memory
*  debug    - select debug mode for a system i/o variable
*  var      - set the value of a system i/o variable
reset
*  debug    - deselect debug mode for a system i/o variable
list
*  vars     - list mnemonics for all system i/o variables
   services - list mnemonics for all service data variables
adjust     - adjust   the table/wallstand bucky device
           -        & the table/wallstand cassette size sensor
           -        & the height of table and wallstand
           -        & the height of ceiling suspension
           -        & offset of celing suspension at actual SID
```

***** = Command not used for service and therefore will be not explained in this manual.

`adjust` = adjustments, should be done via program X-Scope

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13.4.3. List

13.4.3.1. List Services

- Type `list services`↲

A list of all specifications are listed. Press *Enter* key to display next screen page.

13.4.3.2. List Vars

Without function for service.

13.4.4. Show

- Type `show`↲

The topical general system status will be displayed.

13.4.4.1. Show Analogue

- Type `show analogue`↲

The analogue inputs will be displayed.

13.4.4.2. Show Service

- Type `show service`↲

The service inputs will be displayed.

13.4.4.3. Show Display

- Type `show disp`↲

The display inputs will be displayed.

13.4.5. Show Fieldsize

- Type `show fieldsize`↲

The receptorsize will be displayed.

13.4.6. Show Service SID

- Type `show service sid`↲

The SID parameters will be displayed.

13.4.7. Show Service TID

- Type `show service tid` ↲

The current TID will be displayed.

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13.5. Function of the Ctrl Key

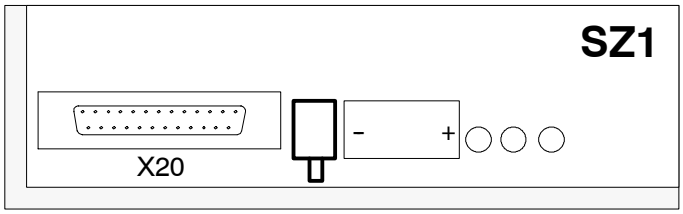
- Press first the *Crtl* key, then the *R* key
- Release both keys.
  The last command line will repeat on screen.

13.6. Set Service Commands

- Type `superuser`↵

13.6.1. Output Errors

To use this command, the subprogram `superuser` should be active.
Reset the bucky controller via reset switch on board **SZ1**.



- Type `set service output_errors_to_vt100 1`↵

Note:
`0` = Disable
`1` = Enable, every action will be displayed on the PC screen.

13.6.2. Error Logging

To list special data call up the bucky memory.

- Type `set service error_logging_mask 1`↵

Note:
`mask 1` = Info
`mask 2` = Warning
`mask 3` = Error
`mask 4` = Fatal

The mask filters the data for displaying on PC screen.

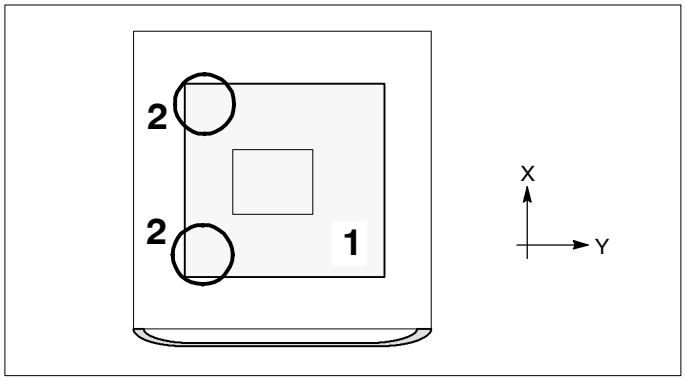
13.6.3. Small Field Size

Manual collimator (e.g. Ralco):
The bucky controller firmware R1.x is installed.

- Type `set service small_fieldsize_x 0`↵
- Type `set service small_fieldsize_y 0`↵

Automatic collimator (e.g. Galileo):
The bucky controller firmware R2.x is installed.

- Type `set service small_fieldsize_x 2200`↵
- Type `set service small_fieldsize_y 2200`↵



The generator takes care of the collimated field:
If the collimated field **1** (which is limited via the collimator shutters) is smaller than 220mm x 220mm, the outer measuring fields **2** can't be selected via the control desk.

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13.6.4. Tomo Acceleration Time

The acceleration time for tomo movements is inversely proportional to the motor current (acceleration ≙ current).

- Type `set service tomo_t_accel X`↵

X = value of tomo acceleration time 200 ... 300
(1 = 5msec / default = 200 = 1sec.)

13.6.5. Tomo Overshoot Time

After making an tomo exposure the ceiling suspension runs into the longitudinal catch lock. If the catch pin doesn't slip in, the run time should be added with the tomo overshoot time.

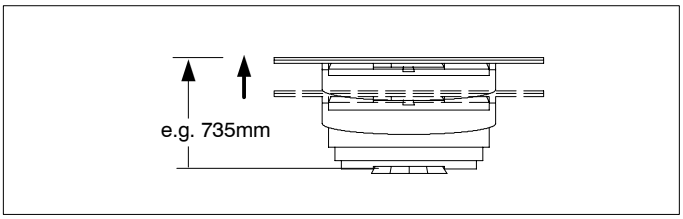
- Type `set service tomo_t_overshoot X`↵

X = value of tomo overshoot time 0 ... 100
(default = 1)

13.6.6. Tomo Table Height

Before program the lower or upper table height, the table top must be raised into this position. The values respect the hysteresis of the 750mm-switch (= table center switch).

Raise table top from lower position into table center switch, the table top will be stopped.



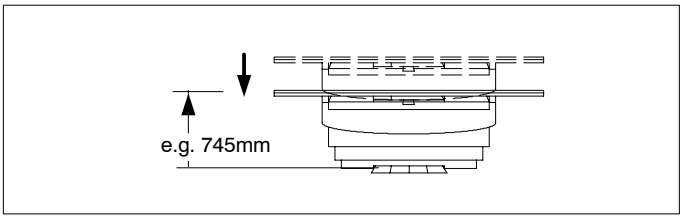
To display the table hight position

- Type `show analogue`↵

- Type `set service table_hgt_tomo_lower X`↵

X = displayed value of table height

Raise table top from upper position into table center switch, the table top will be stopped.



To display the table hight position

- Type `show analogue`↵

- Type `set service table_hgt_tomo_upper X`↵

X = displayed value of table height

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13.6.7. TID

To use this command, the subprogram `superuser` must be activate.
TID = Table Images Distance, distance between the table surface and the film plane, use for adjustment of the displayed tomo height.

- Type `set service tid` XX↵

XX = value of TID, which is to type.
The new TID will be displayed.

14. Final Work

- Press *F10* key

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POWER SUPPLY

TEXT

Contents **4-0.1**
1. Power Supply of a BuckyDiagnost system **4-1**

DRAWINGS

Power supply BuckyDiagnost TH2 4Z-1
Power supply and brakes BuckyDiagnost TH2 4Z-2
BuckyDiagnost TH2 with bucky unit non sensing and OPTIMUS 30 Single phase 4Z-3
BuckyDiagnost TH2 and CS with tomo Power supply and safetyy circuit Z1-3.1
BuckyDiagnost trauma with CS power supply 4Z-4
BuckyDiagnost VR, CS and VE/VT 4Z-11

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1. Power Supply of a BuckyDiagnost system

- See special documentation of subsystems and units.

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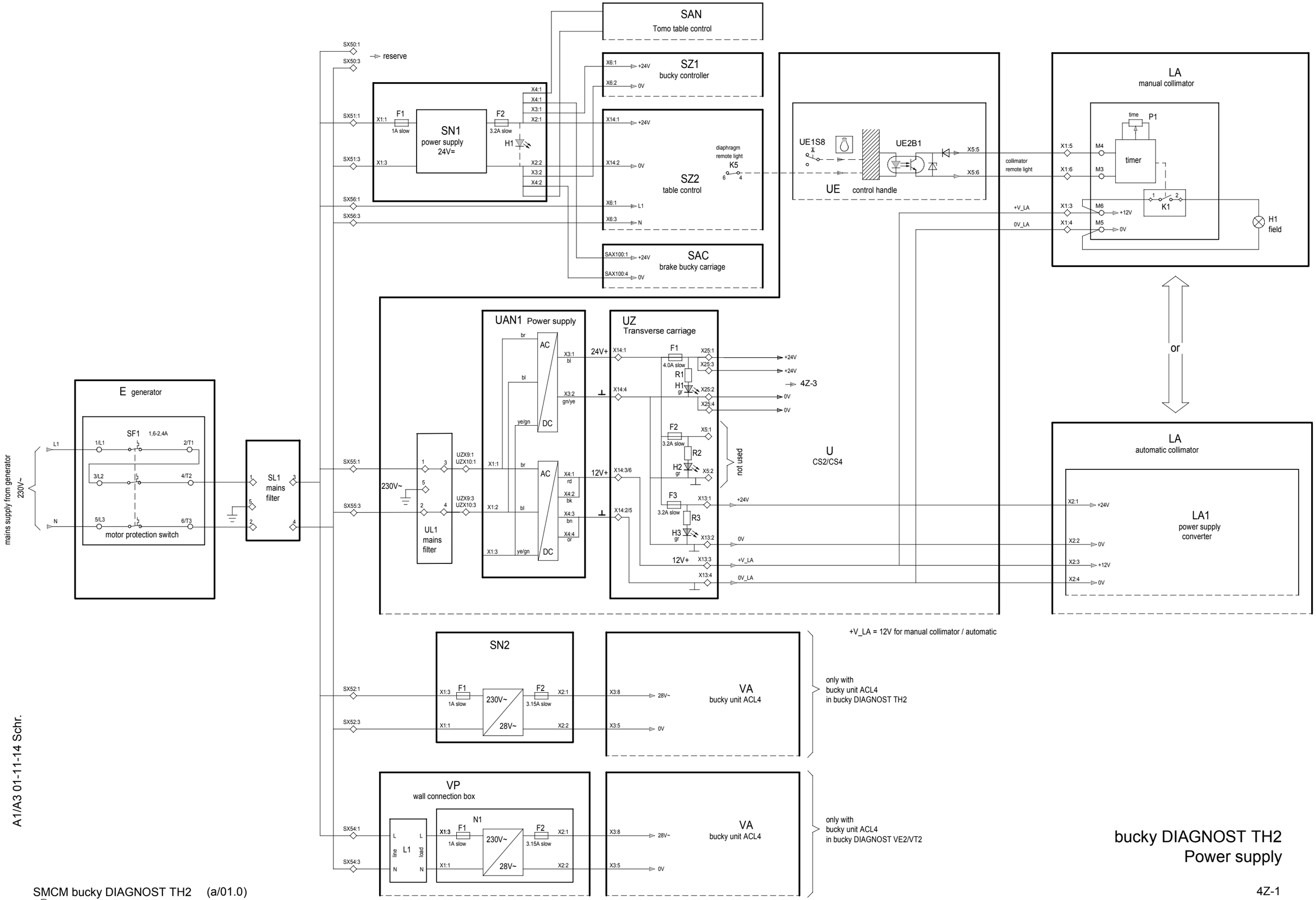

+V_LA = 12V for manual collimator / automatic

A1/A3 01-11-14 Schr.

bucky DIAGNOST TH2
Power supply

4Z-1

SMCM bucky DIAGNOST TH2 (a/01.0)

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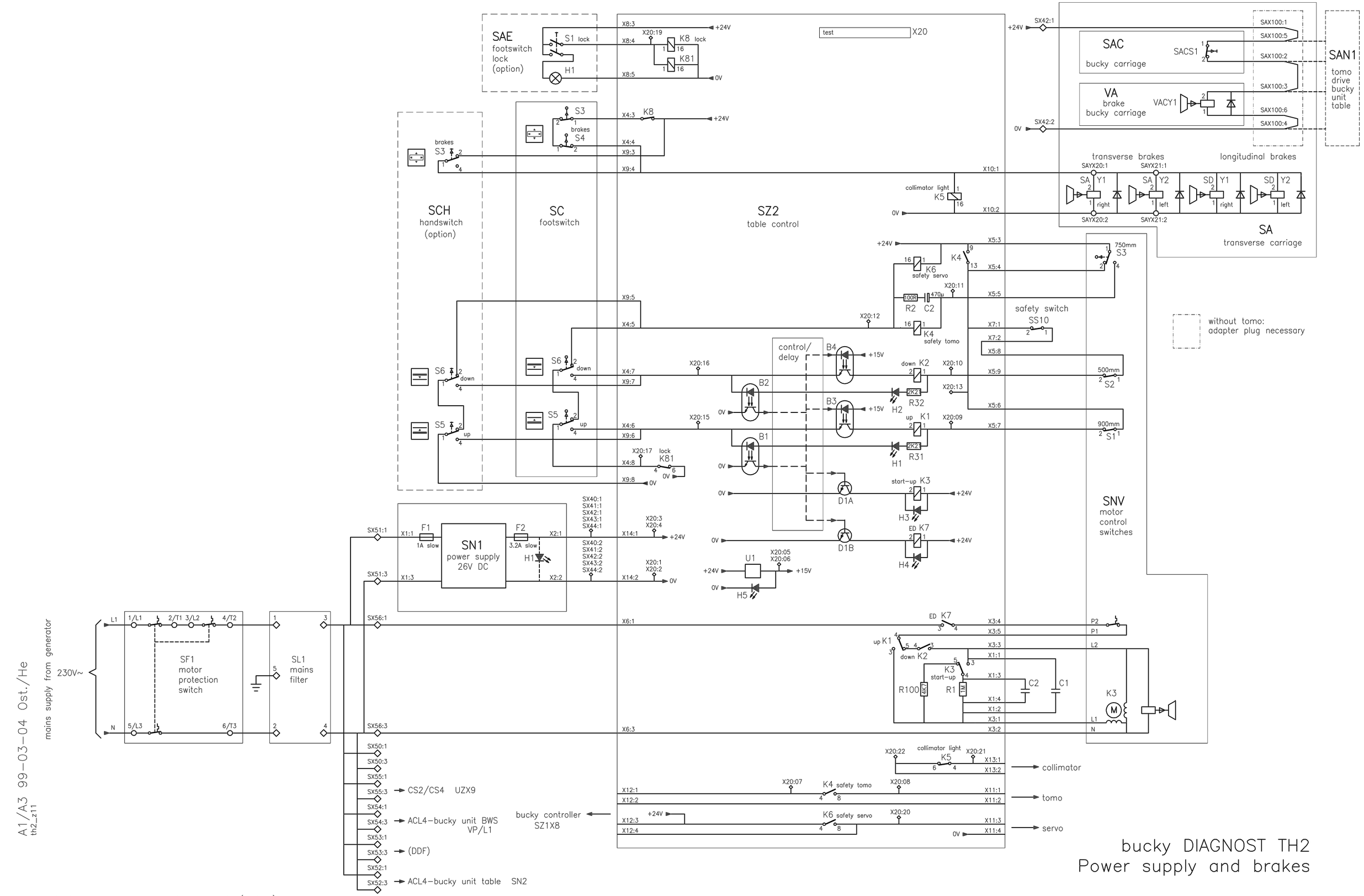

A1/A3 99-03-04 Ost./He
th2_z11

bucky DIAGNOST TH2
Power supply and brakes

4Z-2

SMCM bucky DIAGNOST TH2 (99.0)
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BuckyDiagnost TH2

BuckyDiagnost CS

mains supply bucky table
230V~

SX55:1
SX55:3
230V~
UL1
mains filter
UZX9:1
UZX12:1
UZX9:3
UZX12:3
F1
3.15A slow
R6
Fq
130℃
K2
T1
power supply 24 V=
power supply 24 V=
power supply 40 V=
+28V
UBN3
tomo 2 power supply
C7
F2
SAFETY CONTACT
K1
R8/R9
+24VMOT
+24VDC
+40VDC
H2
H1
H3
control +40VMOT
UFN1
tomo drive alpha
UBN2
tomo drive longitudinal
15V
5V
DC DC
SW1
+24V_MOT
0V_MOT
+40V_MOT
+24VDC
REF_S
UAG
tomo Z-catch
S2
UBN
tomo switches
S1 SAFETY END SWITCH (HEAD AND FOOT)
S3 TRANSVERSE CENTERED
S2 LONGITUDINAL CENTERED
safety circuit
SZ1
bucky controller
SZ2
table control
SAFETY_TOMO2
SAFETY_TOMO1
safety tomo
K4
UBN1
tomo safety circuit
K1 SAFETY RELAY
V12
SERVO SAVE
RELEASE ALL BRAKES
UES21
UES26
UES25
UE
control handle
V64
V22
P2.8
P5.8
D10
driver
S21
S25
Fq = 130℃
inserted in transformer UBN3 T1
SN1
tomo power supply 24V=
SAN1
tomo drive bucky module
SX53:1
SX53:3
1A slow
2.5A slow

A1/A3 03-09-17 Schr.

BuckyDiagnost TH2 and CS with tomo
Power supply and safety circuit

BuckyDiagnost CS
(03.0)

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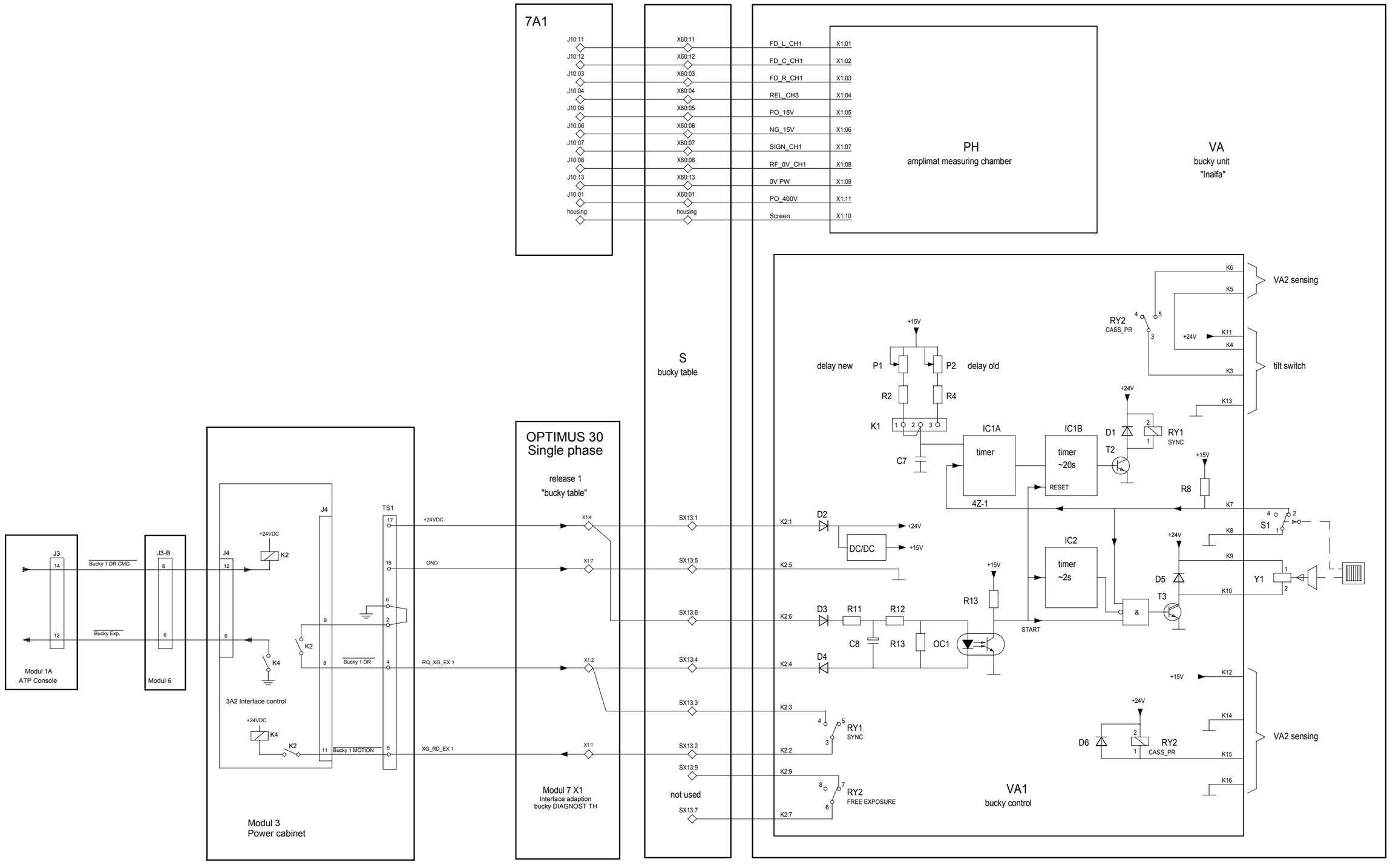
Z1-3.1



A1/A3 03-09-27 Schr.

BuckyDiagnost TH2
with bucky unit non sensing
and OPTIMUS 30 Single phase

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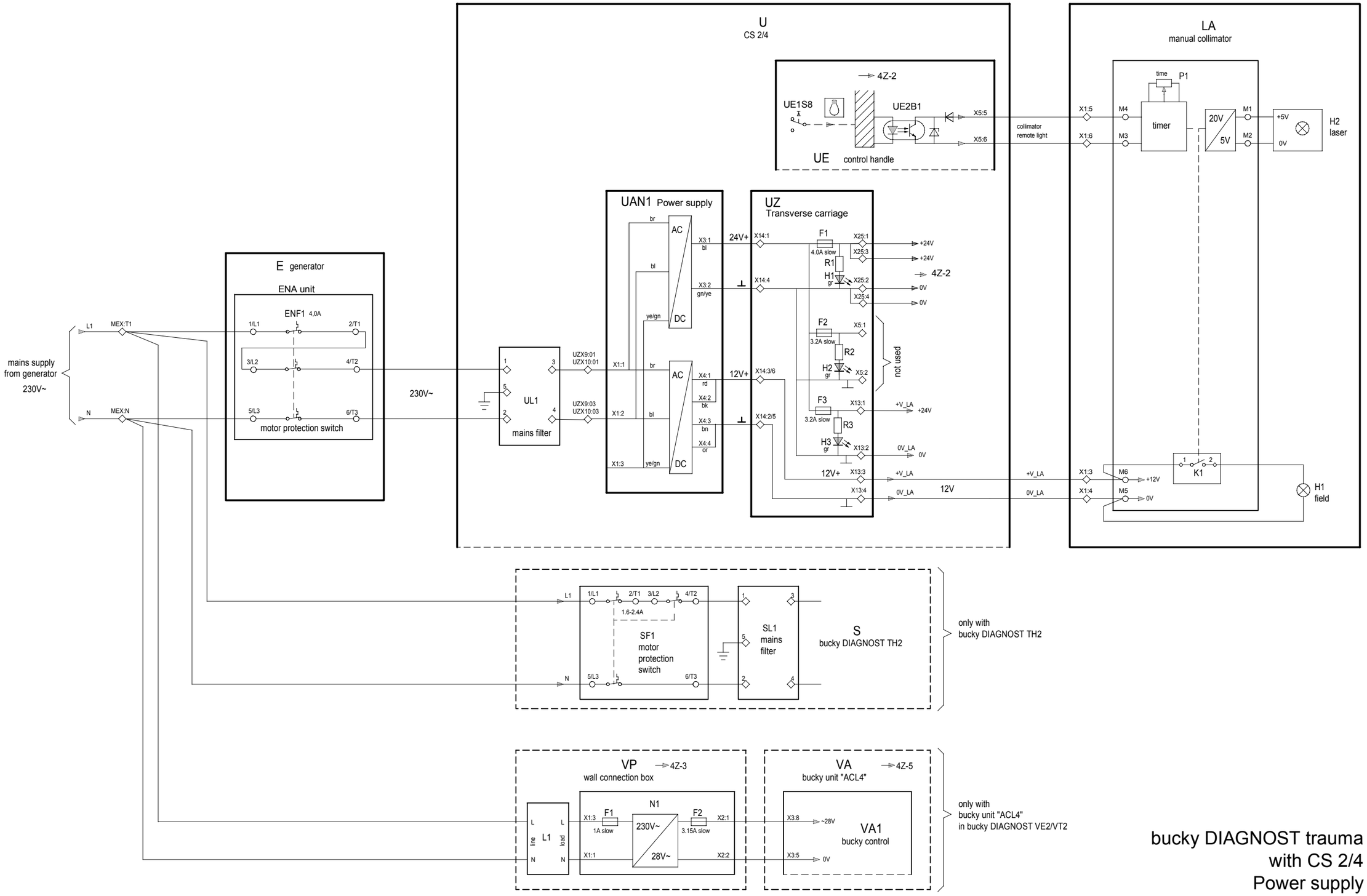

A1/A3 01-11-14 Schr.

bucky DIAGNOST trauma with CS 2/4 Power supply

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bucky DIAGNOST VR, CS and VE/VT with tracking

EZ generator

X44 · 15V · XRG Bus · 12 · 4 · S_CAN_PO (13.6V)

139X1 · X71 C16 S_CAN_L · X87 C17 S_CAN_GND · X72 A16 S_CAN_H · A2 RESET_SW/ · A17 S_CAN_PO · 100R

X42 · 2 · 3 · 6 · 7 · 8 · 9

X43 · 1 · 2 · 3 · 6 · 7 · 8 · 9

RX_CAN_2 · CAN_N · GNDC · GNDC · CAN_P · V15C

S
bucky DIAGNOST VR

X2:1 RX_CAN_2 X3:1
X2:2 CAN_L X3:2
X2:3 GND_CAN X3:3
X2:6 X3:6
X2:7 CAN_H X3:7
X2:8 SW_RESET_CAN X3:8
X2:9 PO_15V_CAN X3:9

D7 CAN controller
V7
D20 driver

U
bucky DIAGNOST CS2/CS4

X3:1 X4:1
X3:2 CAN_L X4:2
X3:3 GND_CAN X4:3
X3:6 X4:6
X3:7 CAN_H X4:7
X3:8 X4:8
X3:9 PO_15V_CAN X4:9

TXD · RXD · CAN driver/ receiver

Control handle
UFX3:1 … UFX3:9 · 100R · CAN Terminator

X9:1 X10:1 X1:1 X11:1 … X9:9 X10:9 X1:9 X11:9

UAF SID height sensor · UZX22:1 UZX21:10 · UZX22:6 UZX21:23

UE2 control handle

LA X-ray beam limiting device

U
bucky DIAGNOST CS2/CS4

230V~ · L1 UZX11:1 · N UZX11:3 · X1:1 · X1:3 · F1 1A slow · F2 2.5A slow · H1

UAN2 power supply 24V=

X4:1 X3:1 X2:1 · X1:4 · X2:2 X3:2 X4:2

15V → +15V · 5V → +5V · SW1 T · DC/DC → -5V

X1:2 +24V_MOT · X1:1 0V_MOT · X1:3

UAD tracking control

X4:1 +24V
X4:5

D1 AD converter

UAN2 tracking drive
X1:4 +24VDC · X1:3 0VDC · X1:2 +24VMOT · X1:1 0VMOT

ST4 +5V · 2 · 3 · TEMPSENS

motor control · power pack · +24VMOT · 0VMOT

X2:8 X2:7 X2:6 · X2:1 X2:2 X2:3 X2:4 X2:5

0VDC +15V

M1 motor

ST3 ST5 ST4 ST5

U2 hall sensor

+5V +5V · RUN D2 · FAILURE D5 · IC3 8-bit micro contoller

+5V 0VDC · X6:1 X6:2 X6:3 X6:4 X6:5

TXD RXD · serial driver/ receiver · ST6:1 ST6:2

IC2 GAL · IC4 GAL · IC9 POS EPROM · IC13 CAN EPROM · IC16 GAL

U1 encoder

A_GEB X5:1 · B_GEB X5:2 · 0VDC X5:4 · +15V X5:5

UAD tracking control

DATA/CONTROL

OUT1 X10:1 · 0VDC X10:2

V1 R1 Y1 clutch

+24VDC X9:2 X9:1 · REF_S +24VDC X9:4 X9:3

UANV tracking drive

+5V · REF D1 · INK_A D3 · INK_B D4

END_L +24VDC X8:2 X8:1 · END_R +24VDC X8:4 X8:3

IC18 CAN processor

X7:1 … X7:16 · jumper tracking · 0VDC

+5V · ST7 2 3 RESET · P1.2 D8 · P1.1 D9 · P1.0 D10

RXD ST8:1 · TXD ST8:2 · 0VDC ST8:3 · +15V ST8:4

V bucky DIAGNOST VE/VT

VN1 transformer · 4512 130 23521

+24V · V5 C2 C5 · X1:1 · VPX5:1 · X5:1 PO_24V_S +24V

VN2 R1 · 3 2 1 · gn X2:3 · br X2:2 · wt X2:1

V1 C3 · R1 C1 · V2

N1 · N2 U/I-converter · R2

V6 · 300R · C6 · V4

X1:6 · VPX5:6 · X5:6 ANALOG_IN_BWS · D1 AD converter

X1:2 · VPX5:2 · X5:2

X2:4 X2:5

X1:3 · VPX5:3 · X5:3 PO_24V_S +24V

X1:4 · VPX5:4 · X5:4 SHUTTER_TRANS_OPEN · D23 driver

X1:5 · VPX5:5 · X5:5 SHUTTER_TRANS_CLOSE · D23 driver

X1:7 · VPX5:7 · X5:7 SHUTTER_LONGI_OPEN · D23 driver

X1:8 · VPX5:8 · X5:8 SHUTTER_LONGI_CLOSE · D23 driver

X1:9 · VPX5:9 · X5:9 SHUTTER_RESET · D23 driver

X3: X3: X3: X3: X3: X3:

S1 S2 S3 S4 S5

VN3 collimator remote control

SZ1 bucky controller

Programming for
"ONE ROOM" configuration

A3 04-09-27 Schr.

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CAN Bus

TEXT

Contents **5-0.1**
1. CAN Bus of a BuckyDiagnost system 5-1
1.1. CAN Bus System of BuckyDiagnost TH2 tomo & tracking 5-2

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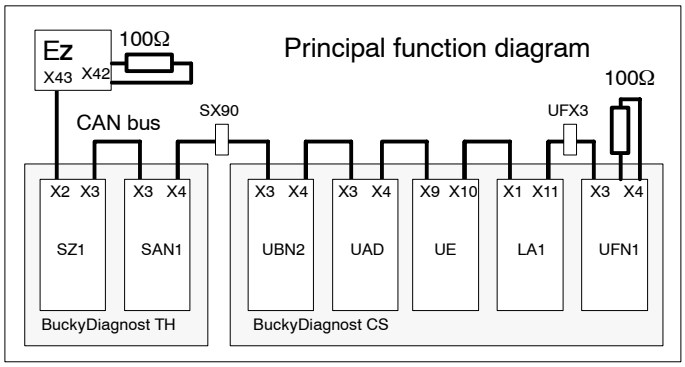
1. CAN Bus of a BuckyDiagnost system

The CAN bus is connected from the generator to the bucky controller in the bucky table, and from there to other CAN bus controlled devices.



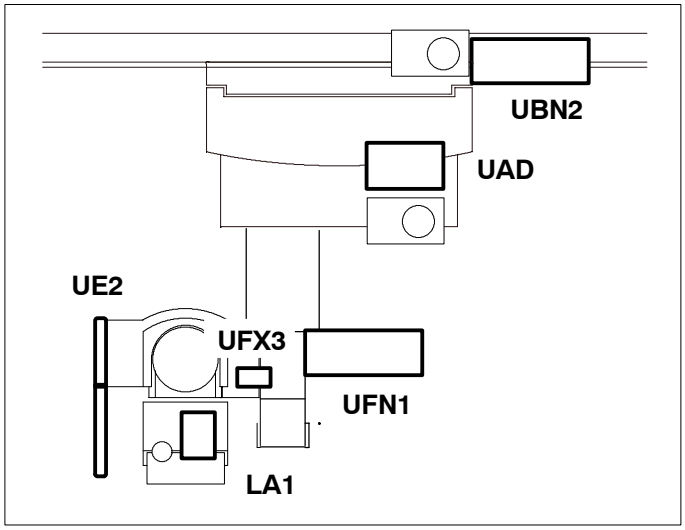
CAN nodes of tomo drive **UBN2** (longitudinal tomo drive)

CAN node of tracking drive **UAD**

CAN node of control handle **UE2**

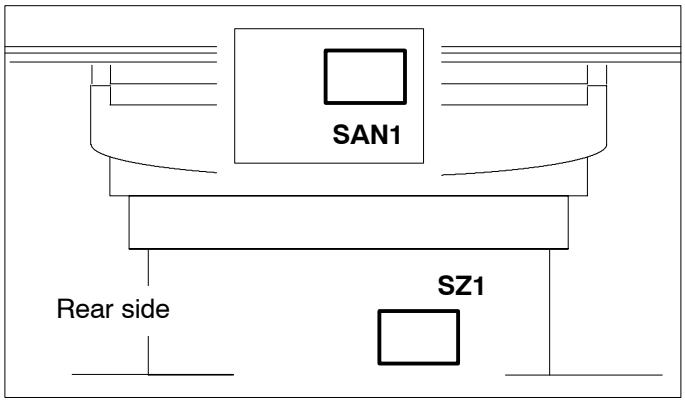
CAN node of tomo drive **UFN1** (alpha tomo drive),

CAN node of automatic collimator **LA1**



CAN node of tomo drive **SAN1** on the bucky carriage

CAN node of bucky controller **SZ1**



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1.1. CAN Bus System of BuckyDiagnost TH2 tomo & tracking

This extensive unit of system includes

generator OPTIMUS **E**

bucky controller **SZ1**

tomo is installed.

table tomo drive & control **SAN1**

connector with 100Ω resistor

ceiling suspension
longitudinal tomo drive & control **UBN2**

tracking is installed.

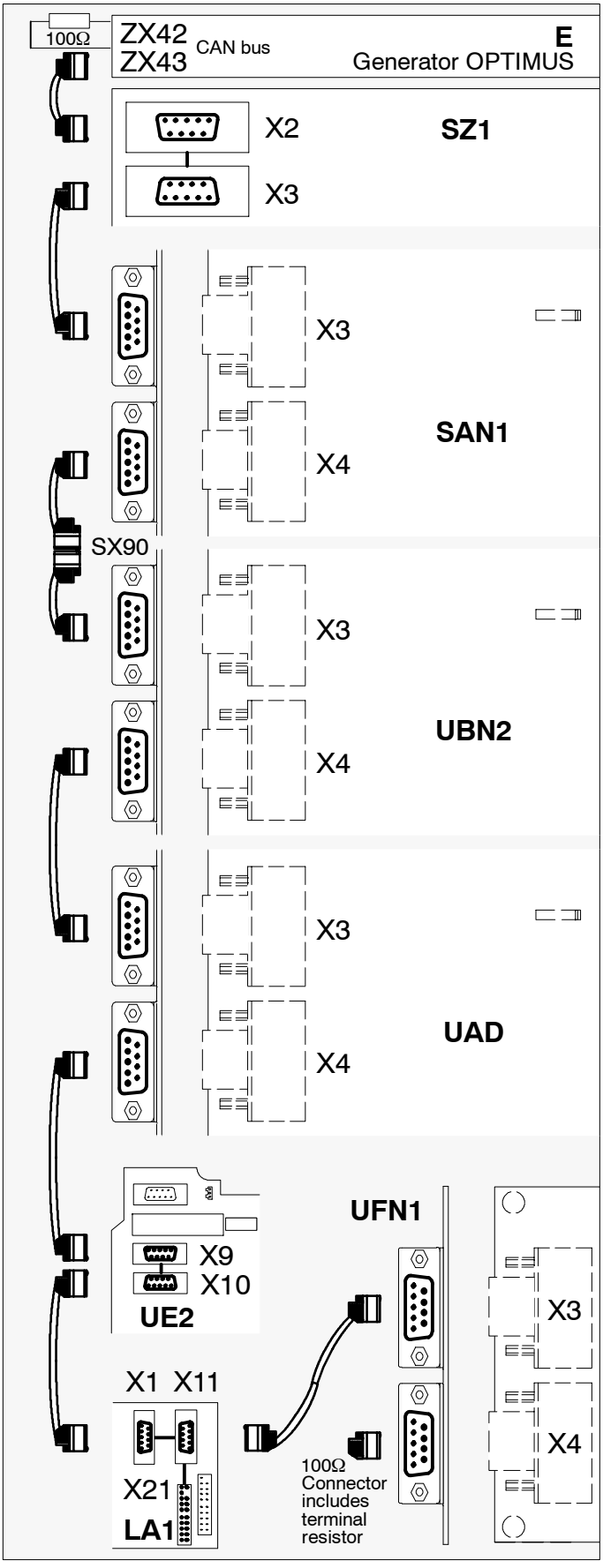
tracking drive & control **UAD**

control handle with display **UE**

automatic collimator **LA**

If a manual collimator is installed the CAN bus is connected from **UE2** to **UFN1** directly.

connector with 100Ω resistor at CAN out on alpha tomo drive & control **UFN1**



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POWER-ON SEQUENCE

TEXT

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1. Power-ON Sequence and Stand-by **6-1**

1.1. Generator Selftest 6-1

1.2. Control Handle Selftest 6-2

1.3. Collimator Selftest 6-2

1.4. BuckyDiagnost TH, Tomo Unit Selftest 6-2

1.5. BuckyDiagnost CS Tomo Unit Selftest 6-3

2. End of Selftest **6-3**

2.1. Generator 6-3

2.2. System 6-4

2.3. BuckyDiagnost TH2 Selftest 6-4

2.3.1. Replacement of the bucky Controller 6-4

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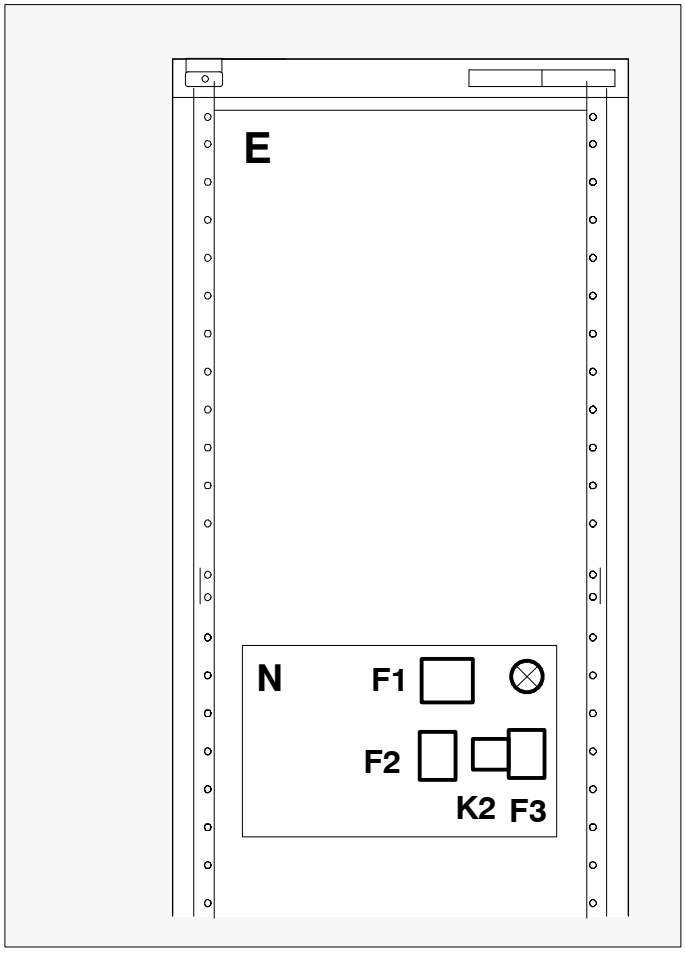
1. Power-ON Sequence and Stand-by

The BuckyDiagnost system runs through a selftest after switching power-on.

- Switch **ON** the system.
  - At the generator switch **ON** automatic circuit-breakers **EN F1**, **EN F2** and **EN F3** if present.

The yellow LED on **EN 100** = **ON** = Power-on.

The relay **EN K2** switches over.



The selftest starts not

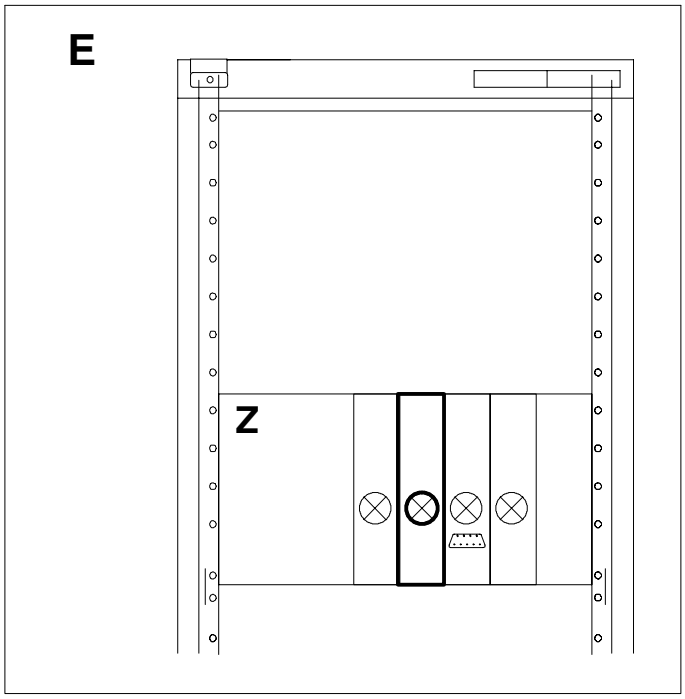
- Check mains
- Check circuit breaker
- Check if circuit breaker **EN F1** is released
  - Look in the error buffer
- Check if circuit breaker **EN F2** is released
  - Check low-voltage supply
  - Check filament circuit
  - Check tube extension
  - Check rotor control
  - Check external current consumers
- Check board **EN100**
- Check **H1** on **EN100** is **ON**
  - Emercency-OFF circuit is open ?
  - The operating desk is not connected ?
- The safety circuit is open ?
  - Close switches

1.1. Generator Selftest

In the starting phase all status LEDs on the **Z** rack flash.

One red LED is **ON** = selftest runs, waiting for CAN communication.

If the red LED = **ON** continously, the selftest is not successful.



- Central unit **EZ139** fails ?
- Voltage control **EZ130** fails ?
- Current control **EZ119** fails ?
- Basic interface **EZ150** fails ?
- Rotor control **EY** fails ?

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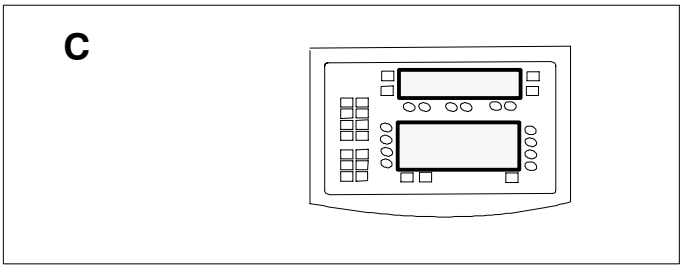
On the control desk **C** all displays are lit on temporarily.

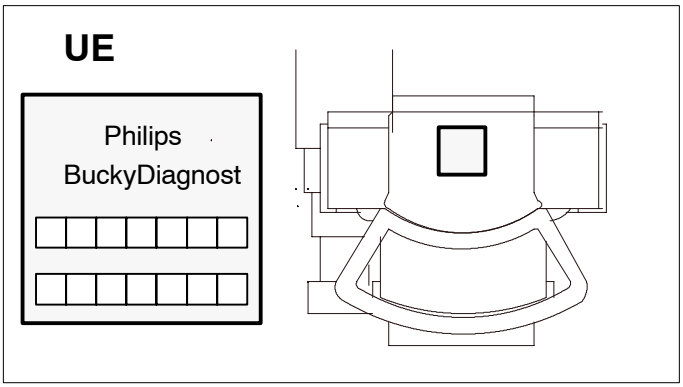


The control desk displays a failure

- Check mains
- Check circuit breaker

1.2. Control Handle Selftest

All displays of the optional control handle are illuminate.
The main display indicates selftest running.
Under the cover of the control handle flashs the red LED on the CPU board.

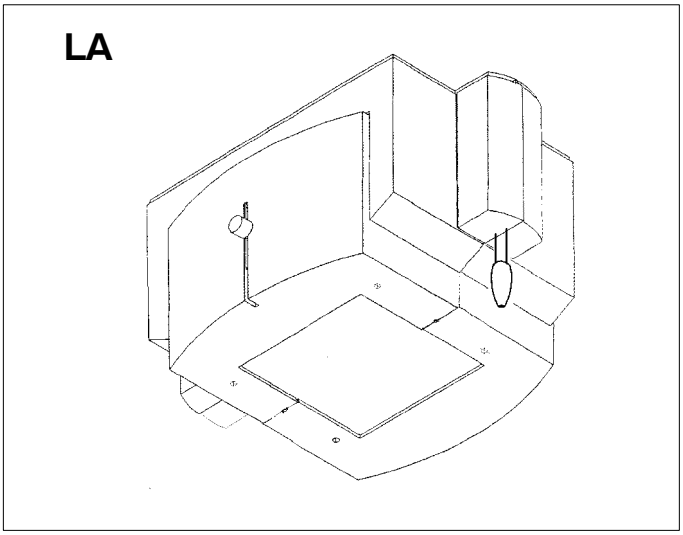


The control desk displays a failure

- Check mains
- Check circuit breaker

1.3. Collimator Selftest

The shutters open and close.
The ruler rolls up and stops.
The red LEDs on the LA2 and LA4 boards are **ON**.

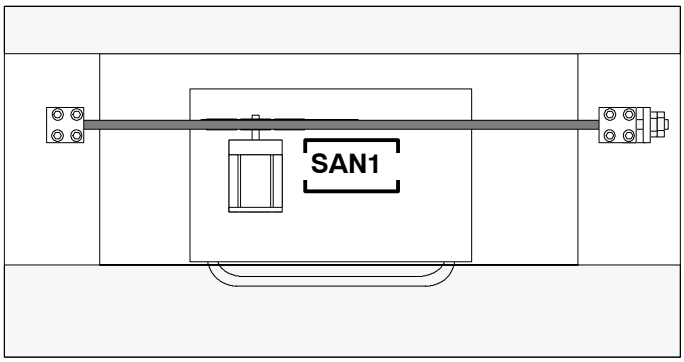


The red LEDs are not **OFF**

- COLRA fails ?
  - Load the the delivered software via the PC into the collimator
  - Calibrate the collimator
- Power supply fails ?
  - Check voltage 5V / 24V

1.4. BuckyDiagnost TH, Tomo Unit Selftest

During the initialization phase the bucky carriage will move to its tomo centre position. The cassette carriage moves to one side and to the other side, then to its center position.



The selftest fails

- Check freely movement of the tray.
  Repeat tomo run test by pressing the button Test on the control handle. Maximal 2 times are possible, then tomography is software blocked.
- Check special circuit

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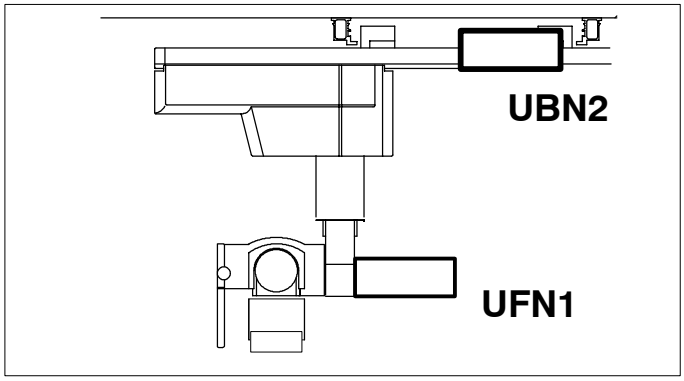
1.5. BuckyDiagnost CS Tomo Unit Selftest

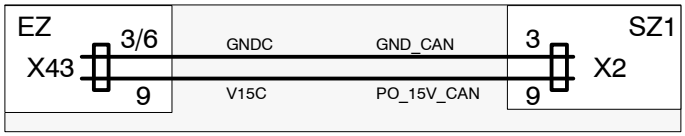
The tomo drive longitudinal and the tomo drive alpha are run. LEDs on the drive boards indicate selftest running.



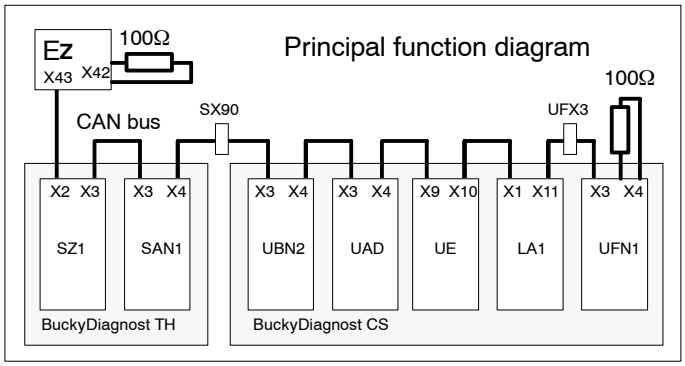
2. End of Selftest

The selftest fails

- The CAN bus fails ?
  - Check power supply of **15V** comming from the generator at **SZ1 X2:9** and **EZ X43:9** to **GND** at **SZ1 X2:3** and **EZ X43:3/6**, see also oscillogram.



- The CAN bus fails ?
  - Disconnect a unit from the CAN bus and connect the cables **CAN in** with **CAN out**
  - Check wires of the CAN bus:
    Start check on the generator **E**
    CAN_L, green wire at Pin 2
    CAN_H, yellow wire at Pin 7

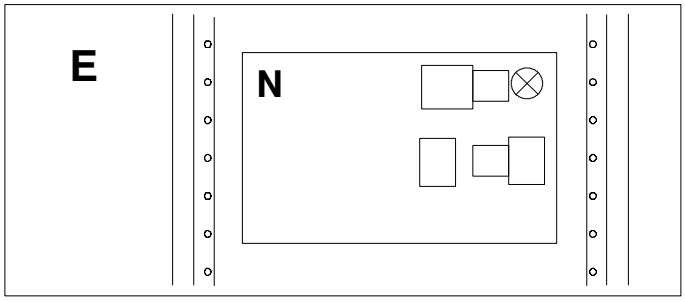


2.1. Generator

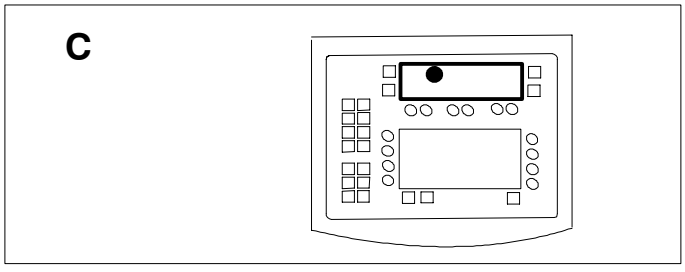
The red status LED lights off = system is ready.

The relay **EN K1** switches on.

The external switches were checked:
unit ready
door contact ready = closed
thermal tube contact ready = closed
tube ready = not overloaded



The READY lamp on the display of the control desk lights up = generator is ready.



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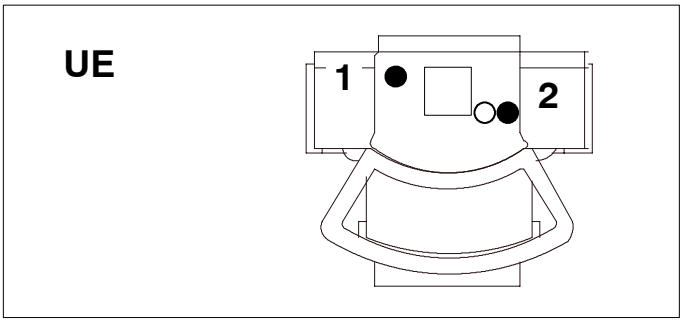
2.2. System

The green EXPOSURE READY LED **1** lights up = system is ready.

The control handle displays the last stored settings.
If the system indicates ready, but the exposure can't be released, look for open safety circuit (e.g. door contact).

If system does not indicate READY press button **2** for test. The control handle displays the failure.

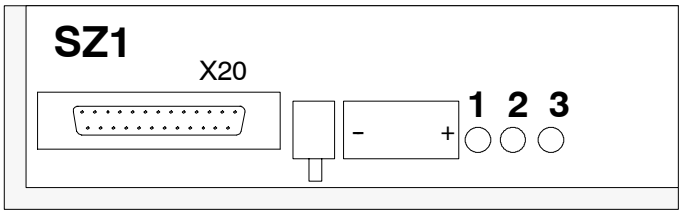


2.3. BuckyDiagnost TH2 Selftest

The red LED **1** lights up till the selftest ends successful.

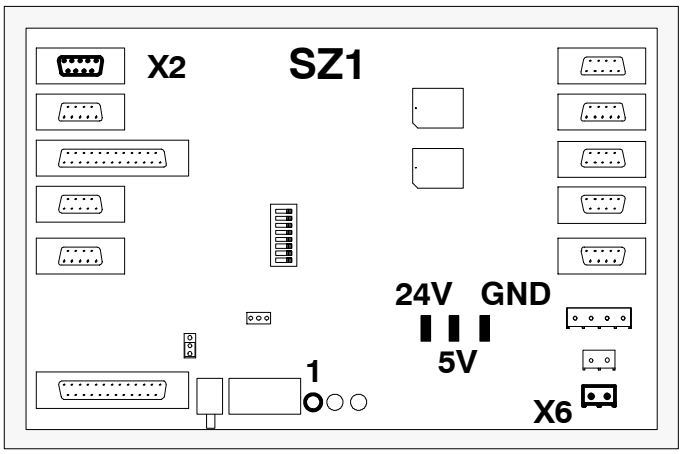
The yellow LED **2** is **ON** continuously during getting contact via CAN bus to each controller and flashs if all controllers connected successfully.

The green LED **3** is **ON** after successful selftest.



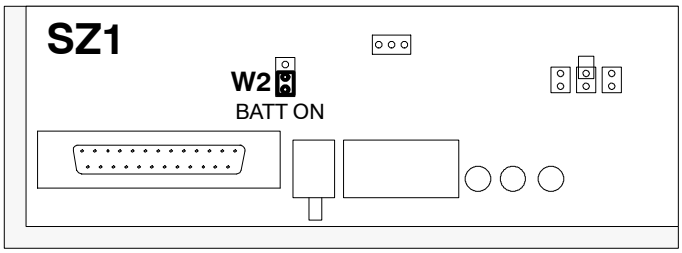
The selftest fails

- Power supply fails ?
  - Check power supply 5V and 24V on board with oscillograph
  - Switch **OFF** the system, remove all cables from the **SZ1** board except power supply cable at **X6** and CAN bus cable at **X2,** then switch system **ON**, check the red LED **1** is **OFF**, if not replace **SZ1** board.



2.3.1. Replacement of the bucky Controller

- Before starting the replacement procedure check position of **W2** (= battery ON) on the new board.
- If the board **SZ1** fails, replace it. Configure the new board via program X-Scope.



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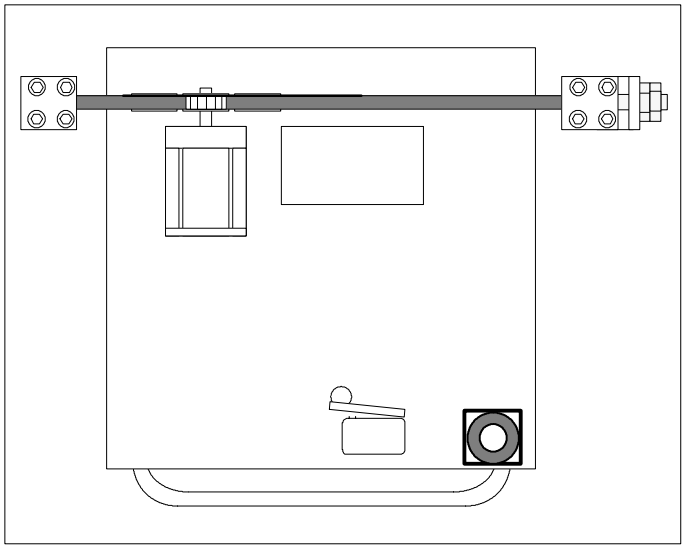
1. Table Conditions

1.1. Tomo Unit Selftest

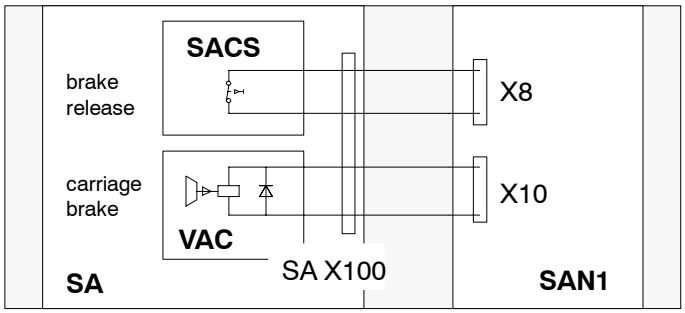
During the initialization phase the bucky carriage moves to its tomo center position. The cassette carriage moves to one side and to the other side, then to its center position.



If tomo unit seftest fails:

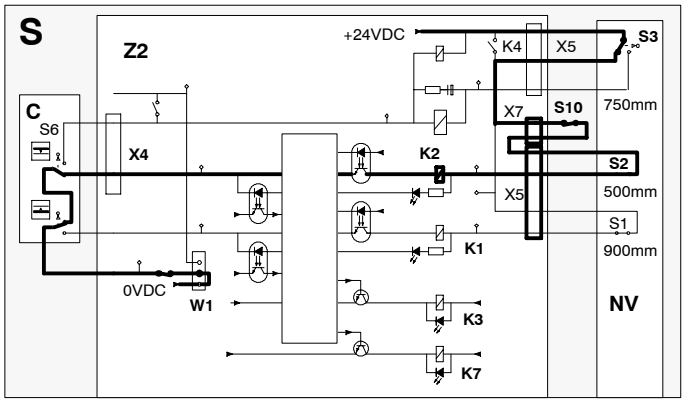
- Check magnetic brake on the bucky carriage.

1.2. Carriage Brake



1.3. Table Middle Position Switch

Tomo drive does not run.



- Check all switches of the circuit as shown in the figure.

See also drawing 4Z–2.

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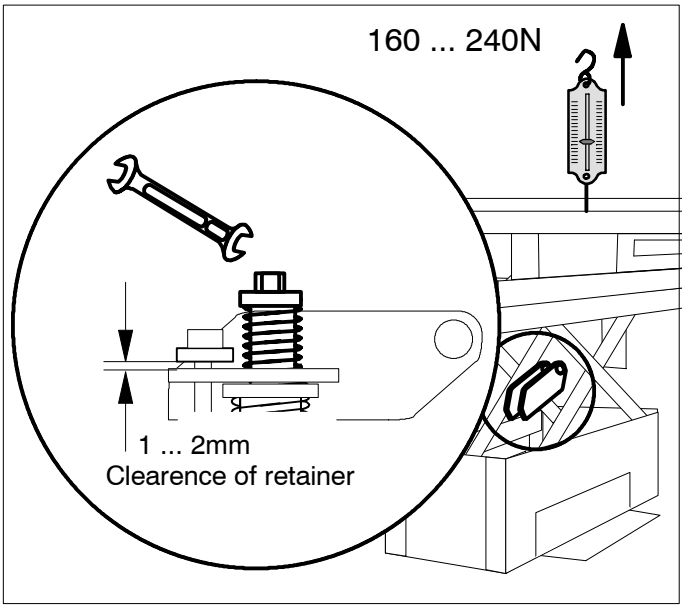
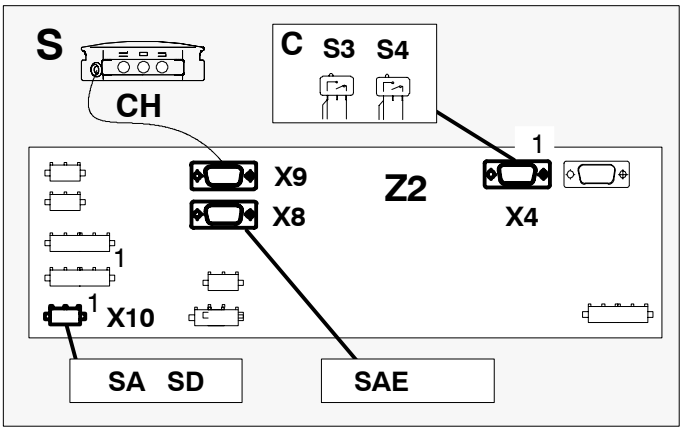
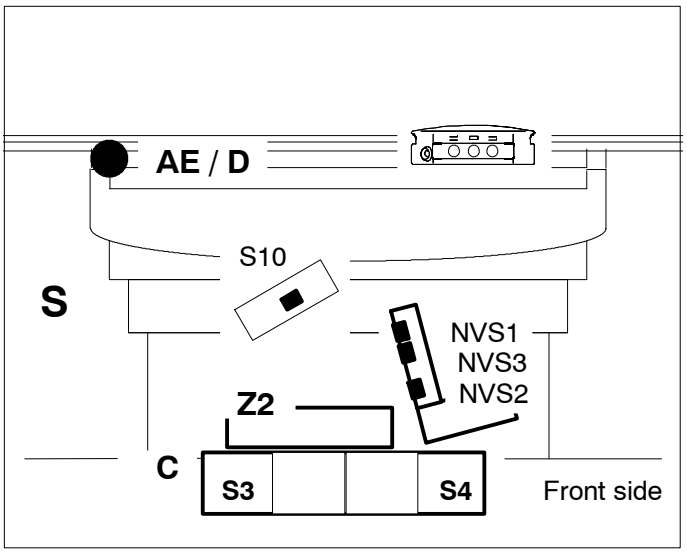
1.4. Collision Switch

- Check force of table movement
  - Pull up the tabletop with a spring scale. The safety switch **SS10** must open if a force of 160 ... 240N is reached. Otherwise:
  - adjust the spring tension at the tension screw with a 13mm–spanner
    clockwise = force of collision decreases
    counterclockwise = force of collision increases



- Check connection to **SZ2 X10**. Voltage of +24V is delivered via the footswitch **SCS3/4** or via the optional second table control switch **SCH**.
  If the footswitches are locked via the footswitch lock **SAE**, functions of tabletop movements via the optional second table control are always possible.





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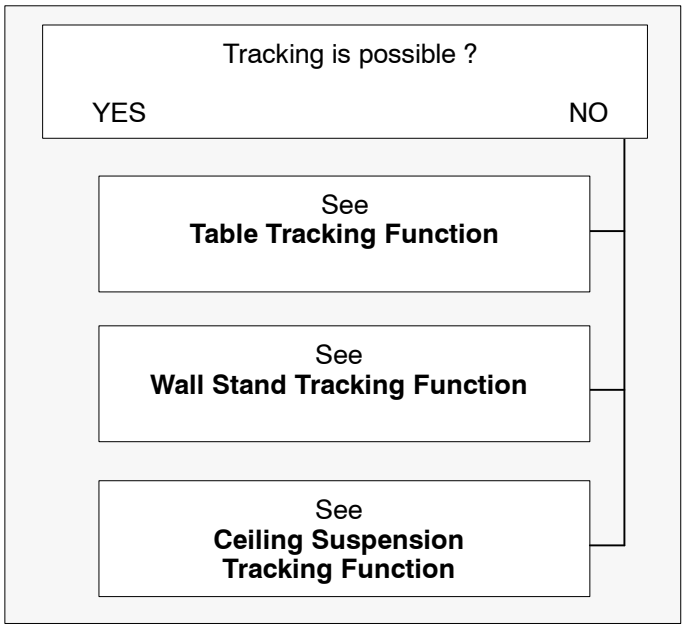
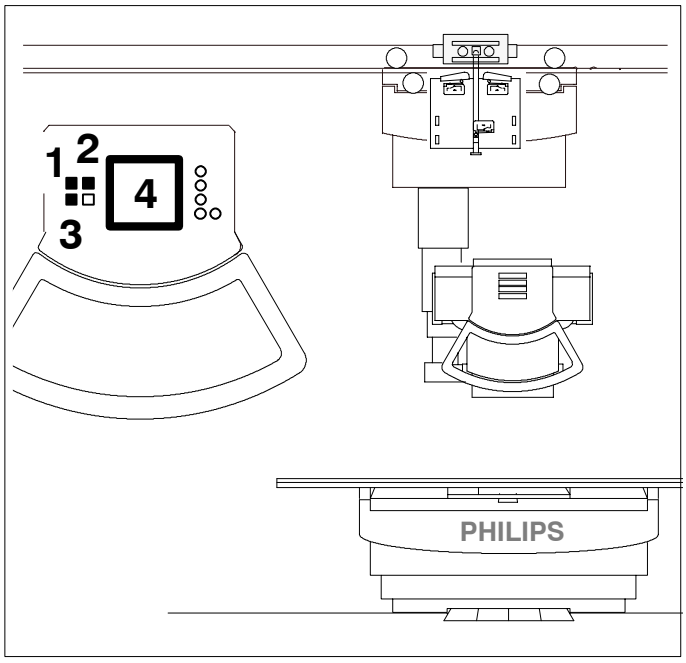
2. Tracking



- Move the ceiling suspension to the respective SID position (e.g. table).



Check of tracking function

- Press **1** to activate tracking CS to TH
  - Follow the instructions on display **4**.
- Press **2** to activate tracking CS with tomo to TH
  - Follow the instructions on display **4**.
- Press **3** to activate tracking CS with VE / VT
  - Follow the instructions on display **4**.

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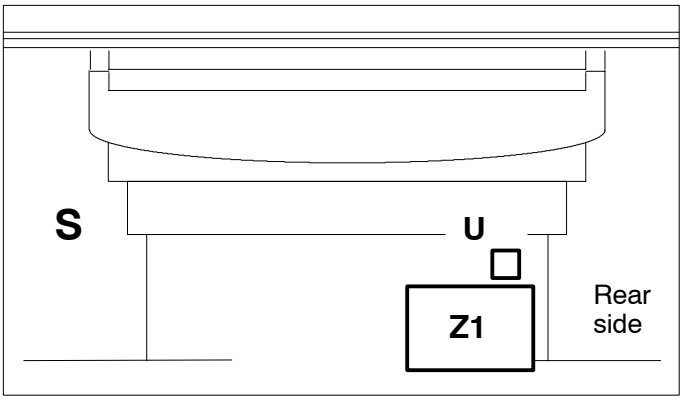
2.1. Table Tracking Function

- Move the table up or down.

The SID is displayed on the control handle. The ceiling suspension should follow respectively.

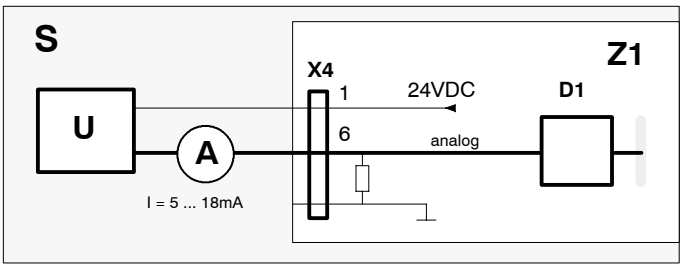


2.1.1. Table Height Sensor

See also drawing 10Z-1.

The height sensor operates as a current source.
The range of current value is 5mA (table is in lowest position) up to 18mA (table is in uppermost position).

The current value can be shown:



- Connect a service PC to **SZ1 X20**
- Call up program VT100 for monitoring
- Type↲
  - `superuser`↲
  - `set service output_errors_to_vt100 1`↲

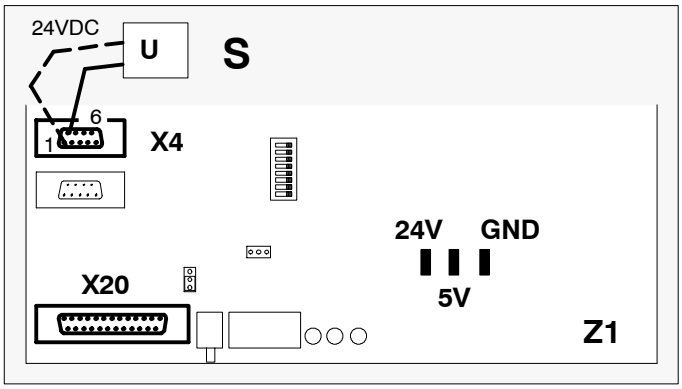
Every action is shown on the PC screen, also the current depending on the actual table height.

- `show analogue`↲

The analogue inputs are displayed on the PC screen.

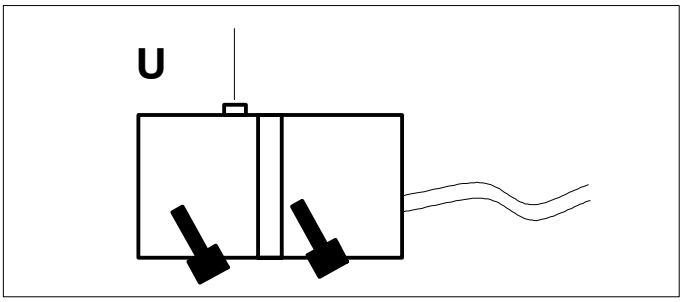
- `show service sid`↲

The SID parameters are displayed on the PC screen.



- Check the height sensor **SU** at **SZ1 X4**, measure the current**.**
  - If I = 0mA, check voltage at **X4:1** or find the reason in the cable.
  - If I = 20mA, check the cable or replace the height unit.

2.1.2. Replacement of the Height Sensor



- Raise the bucky tabletop to the uppermost position.
- Loosen the two screws on the housing.
- Replace the height sensor unit.
- Assemble in reverse order.

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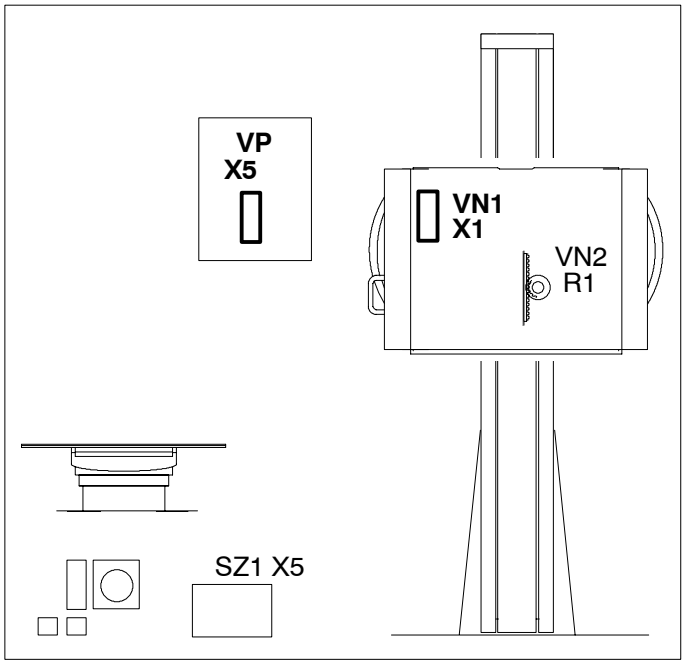
2.2. Wallstand Tracking Function

- Move the wallstand bucky up or down.

The SID is displayed on the control handle. The ceiling suspension should track.

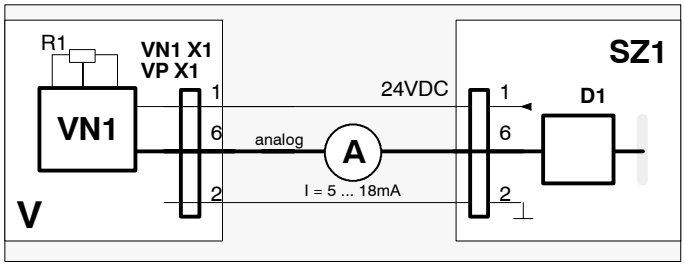
2.2.1. Wallstand Height Sensor



See also drawing 9Z-3.

The height sensor operates as a current source via **VN1**. The range of current value is 5mA (table is in lowest position) up to 18mA (table is in uppermost position).

The current value can be shown:



- Connect a service PC to **SZ1 X20.**
- Call up program VT100 for monitoring.
- Type↲
  - `superuser`↲
  - `set service output_errors_to_vt100 1`↲

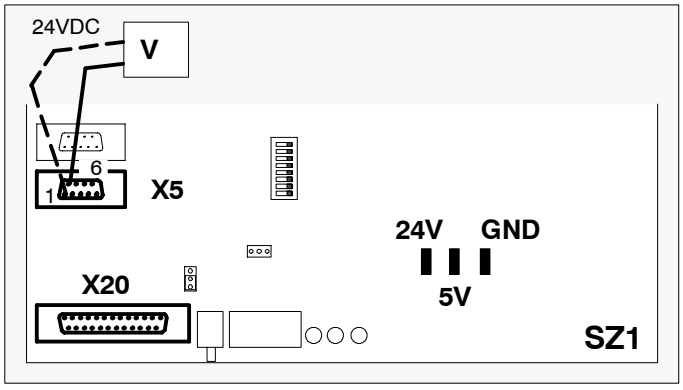
Every action is shown on the PC screen, also the current depending on the actual table height.

- `show analogue`↲

The analogue inputs are displayed on the PC screen.

- `show service sid`↲

The SID parameters are displayed on the PC screen.



- Check the height unit **VN1** at **SZ1 X5**, measure the current
  - If I = 0mA, check voltage at **X5:1** or find the reason in the cable.
  - If I = 20mA, check the cable or replace the height unit.

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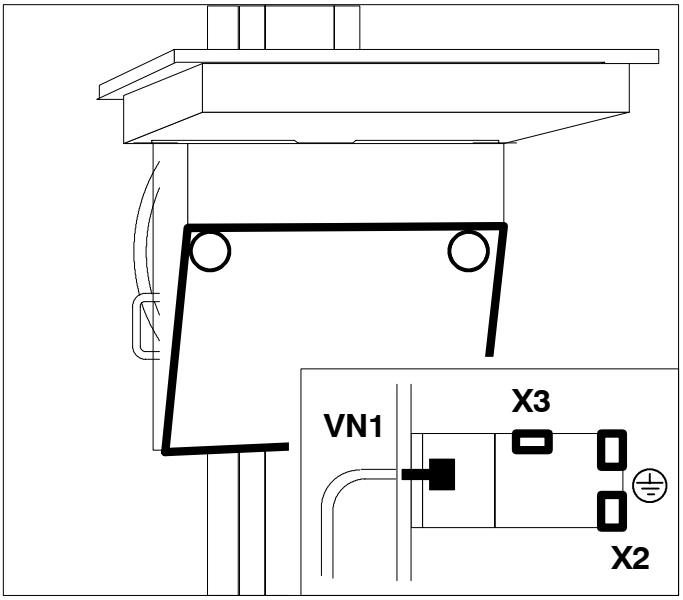
2.2.2. Replacement of the Control Board



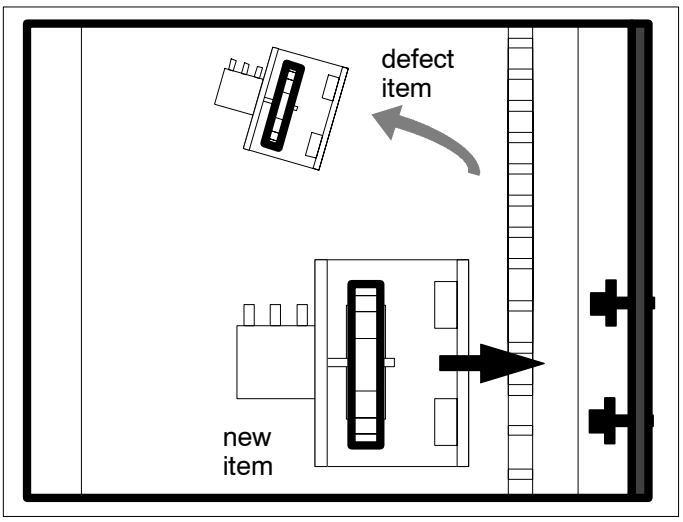
To reach the installation area, the bucky unit has to be tilted to a horizontal position.

- Remove screws.
- Remove cover.

- Disconnect all plugs at the board **VN1.**

- Replace the board after removing the fixing screw.
- Assemble in reverse order.

2.2.3. Replacement of the Height Potentiometer

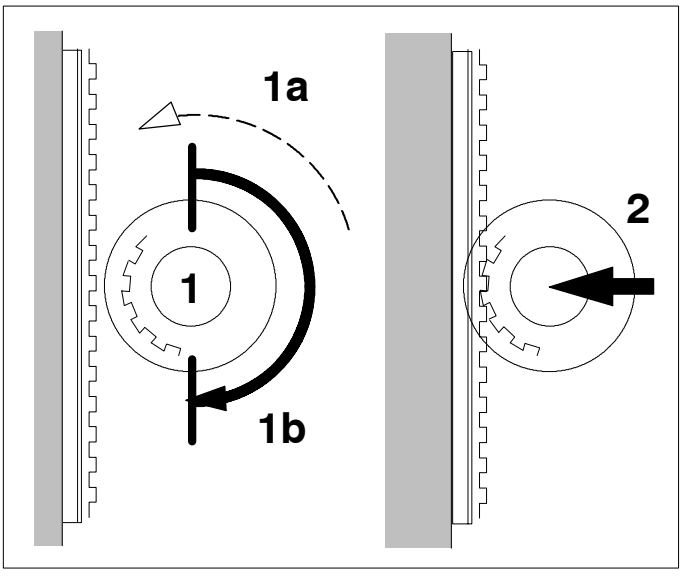


- Move the bucky unit to its **uppermost position**.

- Loosen two **M5x25mm screws** including **washers** on the bucky frame.
- Replace the height potentiometer.

- Assemble in reverse order.

CAUTION:
Note the direction of rotation in the next step.



- Turn the potentiometer **1** manually to the end position **1a**.
- Turn the potentiometer approximately 1/2 turn in the reverse direction **1b**. Make sure it is not at the internal end stop.
- Insert the potentiometer unit **2**.
- Engage the potentiometer assembly with the toothed belt. The potentiometer must be movable but be engaged.
- Tighten the screws using a 7mm spanner.

- Move the bucky unit up and down and check whether the potentiometer is still engaged in the toothed belt through its complete range.

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2.3. Ceiling Suspension Tracking Function

- Move the bucky table or the bucky wallstand up or down.

The ceiling suspension should follow respectively.

The ceiling suspension tracking fails:

- See for error code,
  see Faultfinding Guide with Error Code,
  use program X-Scope on service PC.

2.3.1. Replacement of the Ceiling Suspension Height Sensor

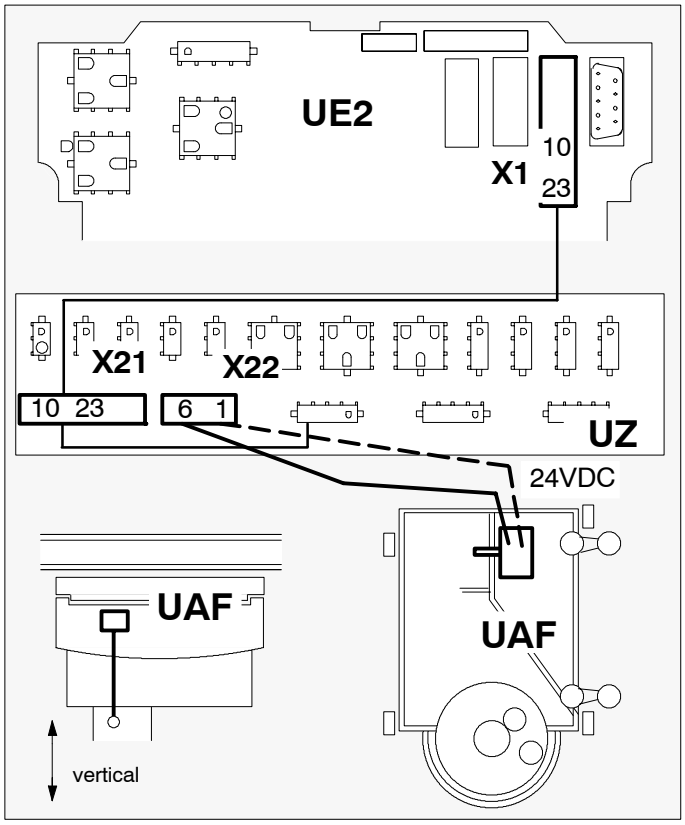
See also drawing 10Z-1.

The SID sensor operates as a current source.
The range of current value is 5mA (table is in lowest position) up to 18mA (table is in uppermost position).

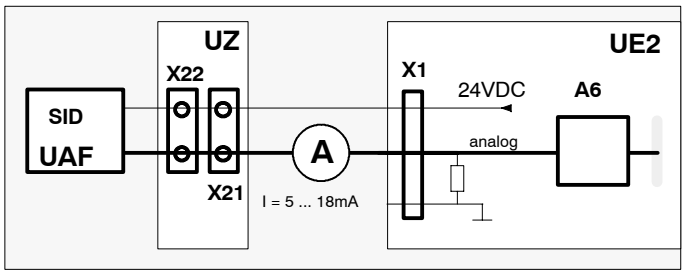
The current value can be shown:

- Connect a service PC to **SX99** on bucky controller.
- Call up program VT100 for monitoring.
- Type `superuser`↵
- Type
  `set service output_errors_to_vt100 1`↵

Every action is shown on the PC screen, also the current depending on the actual table height.



- Check voltage 24V for the SID sensor **UAF** at the control handle **UE2 X1:10** via **UZ X21:10**/**X22:1**



- Check the SID sensor **UAF** at **UE2 X1:23**, measure the current

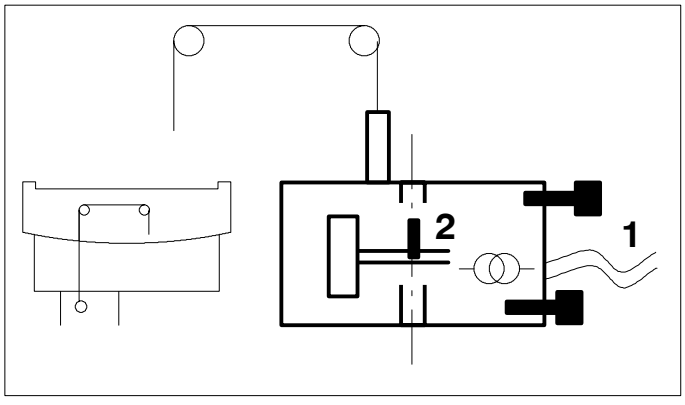
  - If I = 0mA, check voltage at **X4:1** or find the reason in the cable.

  - If I = 20mA, check the cable or replace the SID unit.

2.3.2. Replacement of the Height Sensor

The sensor can be split for replacement of the electronic part.

- Loosen the two screws **1** on the housing.
- Loosen the grub screw **2.**
- Replace the electronic part unit.
- Assemble in reverse order.



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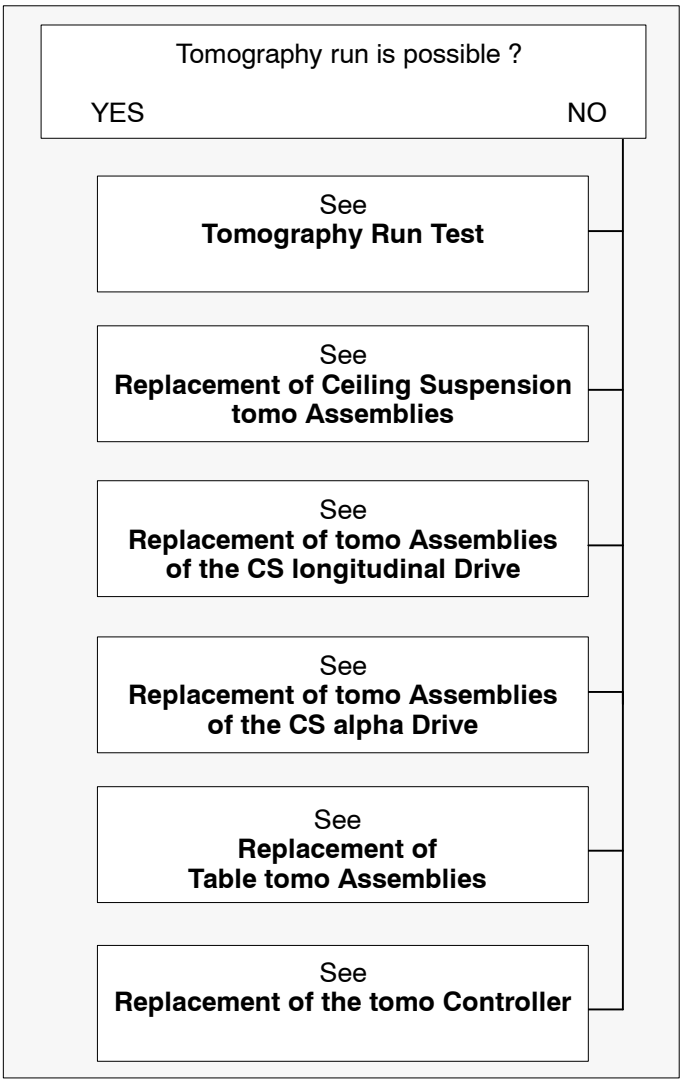
3. Tomography Run

The tomography run fails:

- See for error code,
  see Faultfinding Guide with Error Code,
  use program X-Scope on service PC



3.1. Normal Tomography Run

With the program VT100 it is necessary to see all steps which are appear during the tomography run.

- Call program VT100, use service PC
  - Press *Enter* key

- Type `superuser`
  - Press *Enter* key

```
↲
Bucky>


Bucky> superuser↲
Superuser mode activated
```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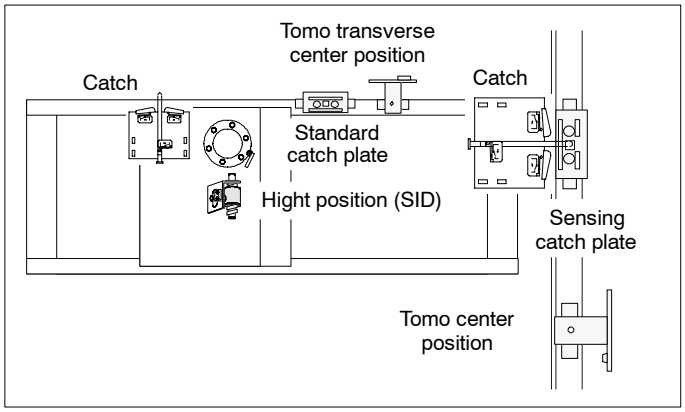
3.1.1. Basic Preparation

- Lift the table into the working position.

- Move the ceiling suspension CS into the tomo position
  => two switches of tomo center position active
  two switches of system center position active
  two switches of Z-axis active
  switch of CS beta position active.

  If a cassette tray with sensing is installed, a cassette has to be inserted.



All information on the circuit elements is listed. The CS is positioned into tomo position.
The listed lines include date and time of the procedure. This is not displayed in figure.

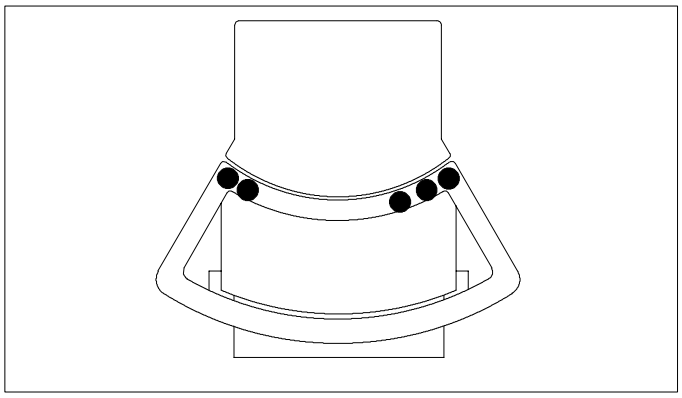
```
Bucky>
(I  ) CHD1> KEY : Pressed Vertical
(I  ) CS1 > Z default pos : Locked
(I  ) Bucky ready
(I  ) CS1 > Z default pos : Unlocked
(I  ) XRG > Status : Ready
(I  ) CS1 > Z default pos : Locked
(I  ) Bucky not ready
(I  ) XRG > Status : Not Ready
(I  ) Bucky ready
(I  ) XRG > Status : Ready
(I  ) BLD1> Receptor x=240, y=300
(I  ) CHD1> KEY : Released Vertical
Bucky>
```

Explanation:

`(I  )` = Status of a message
- `I` = information
- `W` = warning
- `E` = error
- `F` = fatal error

`CHD1>` = Device or item
- `BLD` = collimator
- `CHD` = control handle
- `CS` = ceiling suspension
- `RAD` = bucky controller
- `XRG` = generator
  - `1` or `2` = room number
- `KEY :` = Special item

`...` = Special information



If all positions o.k., all green LEDs of positions are illuminated.

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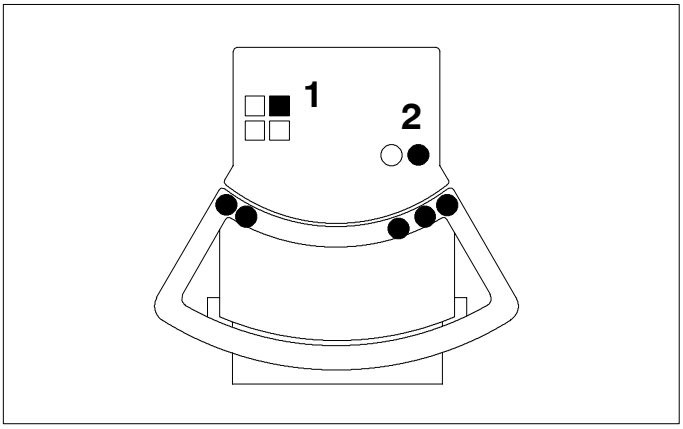
3.1.2. Tomography Run Test

- **1** Select for tomography RGDV2



The current tomo program is shown in the control handle display. All lamps on the control handle are ON.

- Start tomo program for test
  - **2** Press Test key

The complete procedure of tomography run is done. Each step of the tomography run can be displayed via VT100 monitor.

Explanation:
The displayed information in the figure shows the status of switches.

key **Test** is pressed

tomo test relay is active
tomo safety relay is closed
cassette tray runs into center position
CS motor drive is excited
α drive motor is excited
cassette tray is excited
CS runs out of the catch plate at the longitudinal side
CS runs into tomo start position
tube turns into tomo start position
cassette tray runs into tomo start position
tube is out of vertical position
tube turns through the angle of 0 degree
tube turns to the other side of tomo position
tube turns back into the vertical position
CS runs into the catch plate at longitudinal side

key **Test** is released (after tomo run this information is displayed)
tomo test relay is inactive
tomo safety relay is open
bucky controller is not ready
generator status is not ready
bucky controller is ready
generator status is ready
CS, tube and cassette tray return to default values

```
Bucky>
(I  ) CHD1> KEY : Pressed Tomo Test
(I  ) -- Tomography Run Initiated --
(I  ) Tomo test relay: ON
(I  ) TOM1> Safety relay : Closed
(I  ) TOM1> Tray  : Referenced
(I  ) TOM1> CS    : Activated
(I  ) TOM1> Alpha : Activated
(I  ) TOM1> Tray  : Activated
(I  ) CS1 > Long : No Position
(I  ) TOM1> CS    : Prepared
(I  ) TOM1> Alpha : Prepared
(I  ) TOM1> Tray  : Prepared
(I  ) CS1 > Alpha : No Angle
(I  ) CS1 > Alpha : 0 degrees
(I  ) CS1 > Alpha : No Angle
(I  ) CS1 > Alpha : 0 degrees
(I  ) CS1 > Long : Position 3
(I  ) -- Tomography Run Completed --
(I  ) CHD1> KEY : Released Tomo Test
(I  ) Tomo test relay: OFF
(I  ) TOM1> Safety relay : Open
(I  ) Bucky not ready
(I  ) XRG > Status : Not Ready
(I  ) Bucky ready
(I  ) XRG > Status : Ready
(I  ) TOM1> CS    : Init
(I  ) TOM1> Alpha : Init
(I  ) TOM1> Tray  : Init
Bucky>
```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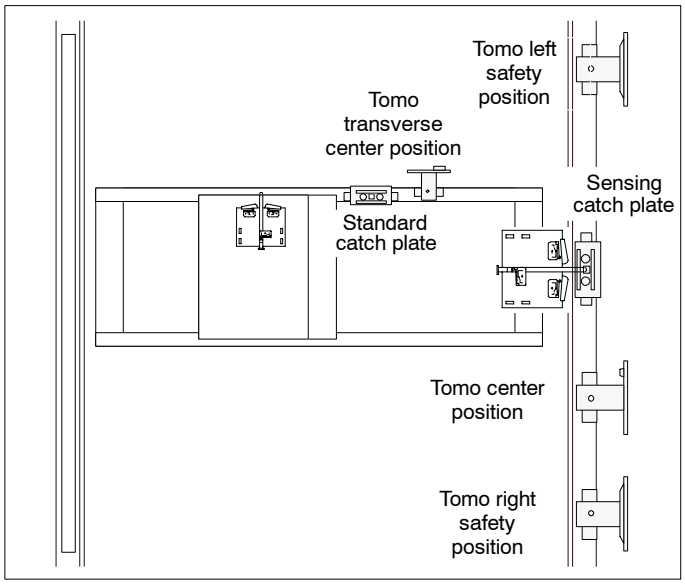
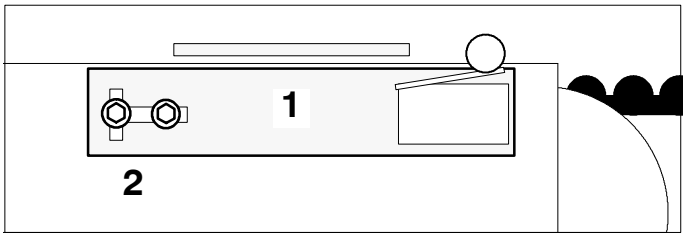
4. Replacement of Ceiling Suspension tomo Assemblies

4.1. Adjustment of the tomo Switches

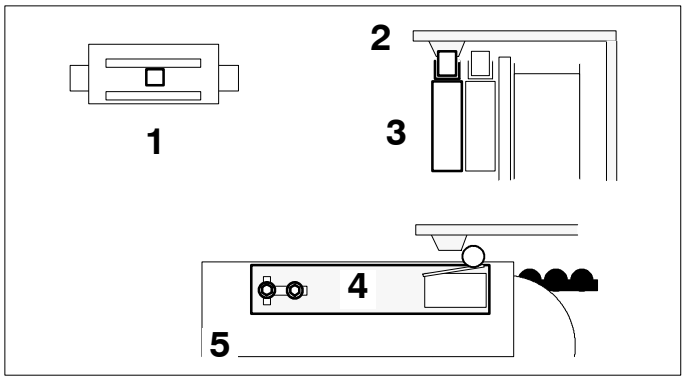


4.1.1. Adjustment of the tomo Switches



- Adjust the tomo switch.
  - Bring the switch plate **1** for the center switch and the safety end switch into the horizontal position.
  - Loosen the screws **2**.
  - Tighten the plate with the two screws **2**.

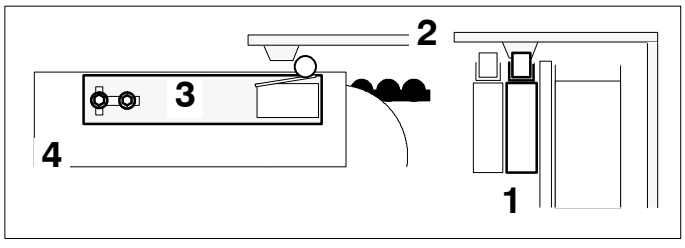
4.1.2. Tomo Center Position Switch



- Move the ceiling suspension into the system center position. The pins of the catches (longitudinal and transversal) lock into the catch plates **1**.
- Postion the holder of the switching cam **2** of the tomo center position with respect to the switch **3**.
- Adjust the switch plate **3** with respect to the cam **2**.
- Tighten the plate **4** with the two screws **5**.

The switches are adjusted correctly if the respective switching cam touches only the respective switch.

4.1.3. Tomo Safety End Position Switch



- Move the ceiling suspension to the tomo safety end position. The switch **1** touches the cam **2**.
- Adjust the switch plate **3** to the cam **2**.
- Tighten the plate **3** with the two screws **4**.
- Check function of the safety position at the left and the right side.
  - If necessary, repeat adjustment procedure for the other safety position, too.

The switches are adjusted correctly if the respective switching cam touches only the respective switch.

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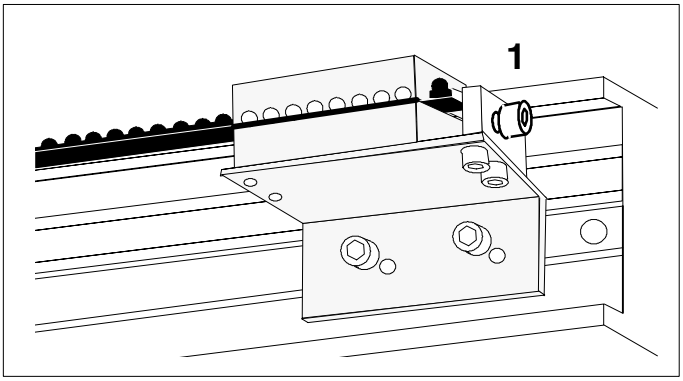
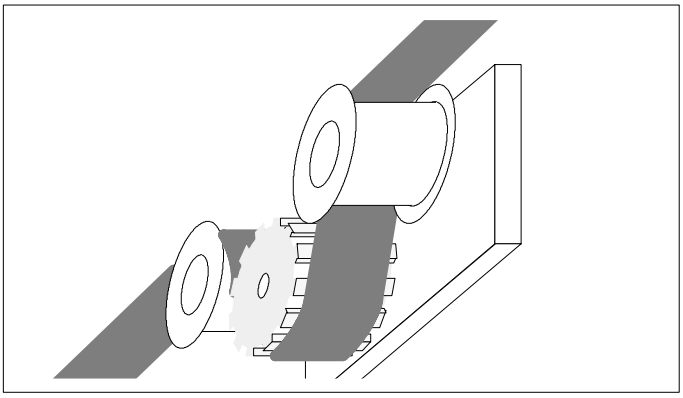
4.2. Replacement of the tomo Belt

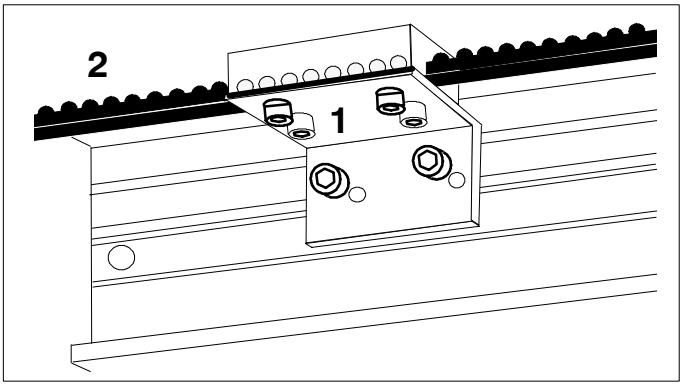
- Release the tightening screw **1** to the maximum position.
- Replace the toothed belt and fix a new one at the tightening block so that **one** tooth is outside the block.





- Put the new toothed belt around the tomo drive.

- Loosen four screws **1** in the longitudinal rail at the opposite end.
- Insert the belt into the block.
- Tighten the belt with the tightening block. Fasten the four screws **1**.
- Cut the remaining belt **2** so one tooth is outside the block.



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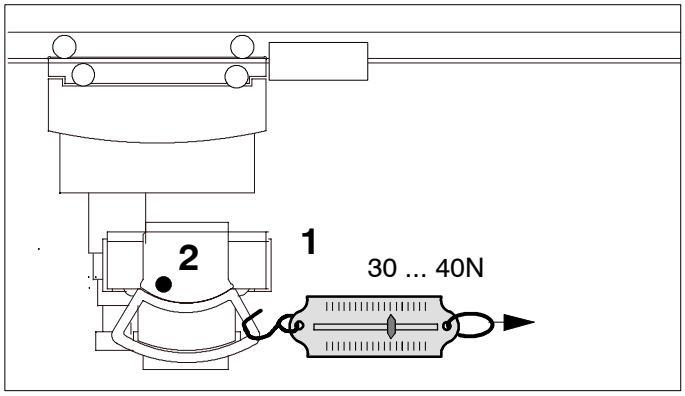
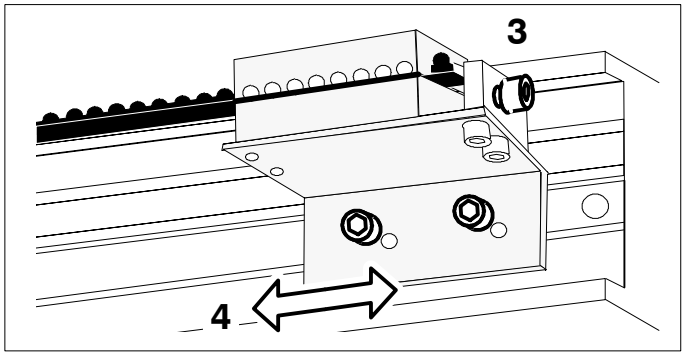
4.3. Adjustment of Tomo Force

The CS Servo Assistance can be defined, see manual X-Scope for bucky controller firmware,
Tomography Configuration.



- Move the ceiling suspension out of the center position so that the pin of the catch does not lock.
- Switch **OFF** the system.
- **1** Hook a spring balance into the control handle.
  - Pull the ceiling suspension with the spring balance.
    The value of force is 30 ... 40N.

- Switch **ON** the system.
- **1** Hook a spring balance into the control handle.
- Press green button **2** to release the longitudinal brake.
  - Pull the ceiling suspension with the spring balance.
    The value of force is 15 ... 20N.
    The value of force is 10N for a system with Servo.



If necessary, loosen or tighten screw **3** to tighten the belt. For more clearence slide the holder by loosening the screws **4**.

- Repeat procedure as described above.

For

Replacement of the tomo Motor
Check of Centering the tomo Drive
Replacement of the tomo Printed-Circuit Boards
Exchange of EPROMs

see Replacement of the tomo Assemblies of the bucky Table.

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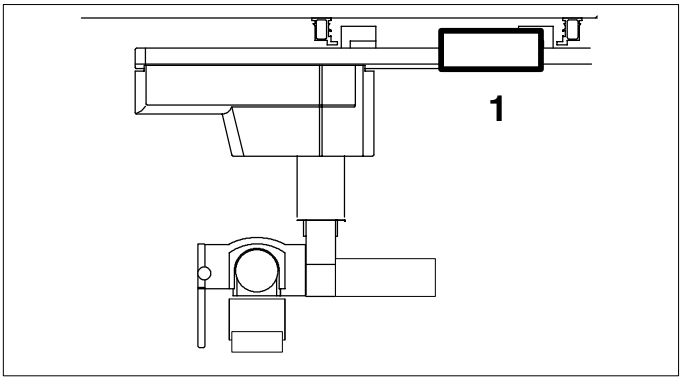
4.4. Replacement of the tomo Assemblies of the CS longitudinal Drive

Switch **OFF** the system, disconnect the electrical support at the generator.

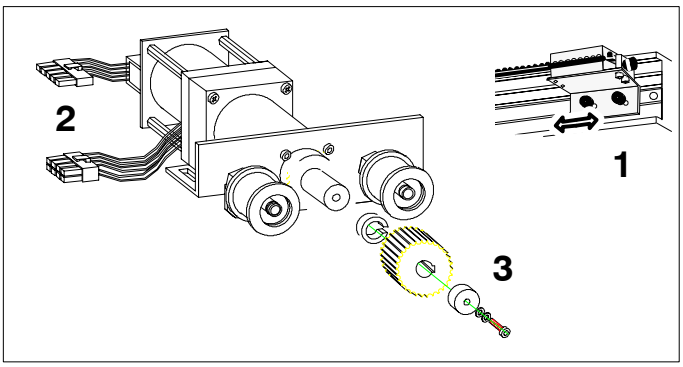


- Move the CS into a catch plate.
- Dismantle the longitudinal drive **1**.
  - Remove screws and cover parts.

4.5. Replacement of the tomo Motor

- **1** Release the belt at the tightening block.
- Remove the toothed belt from the tomo motor.
- **2** Disconnect the motor from the printed circuit board.
- **3** Loosen the grub screw, remove the gear.
- Remove the four screws, replace the motor.

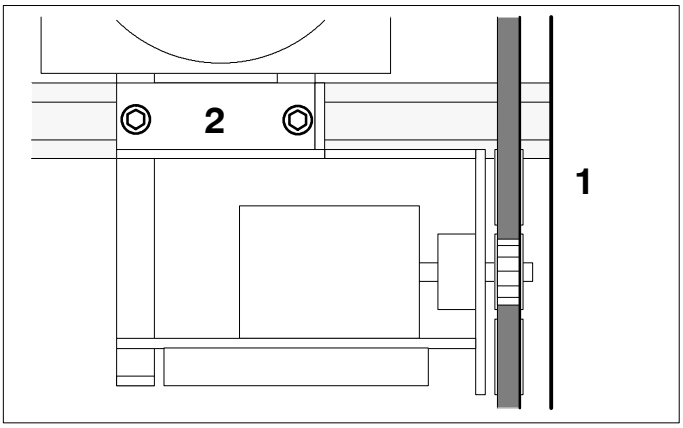
- Assemble in reverse order as specified above.



4.5.1. Check of tomo Drive Centering

- Move the ceiling suspension over the whole longitudinal range and check whether the toothed belt runs **parallel** to the rails **1**.
  If necessary, adjust the tomo motor unit by loosening the two fixing screws **2** in the transverse rail.

- Ensure that the screws are tightened after adjustment.



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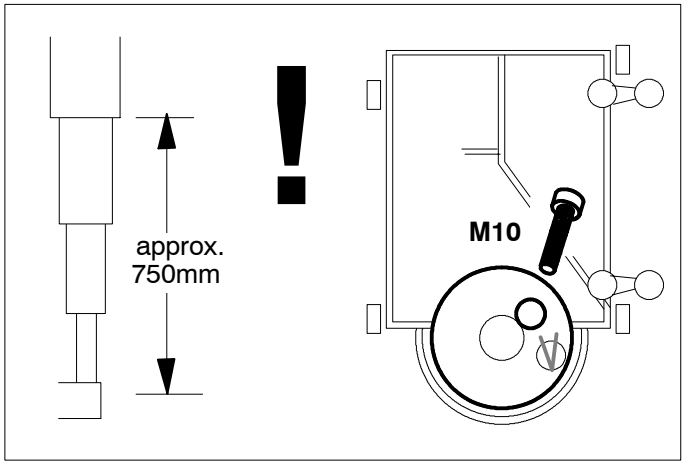
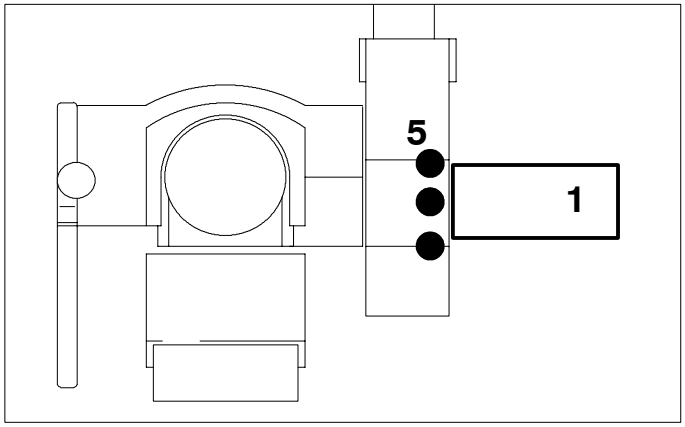
4.6. Replacement of the tomo Assemblies of the CS alpha Drive

To do the following steps, the telescopic system has to remain locked at the middle of its range of movement (extension 750mm).



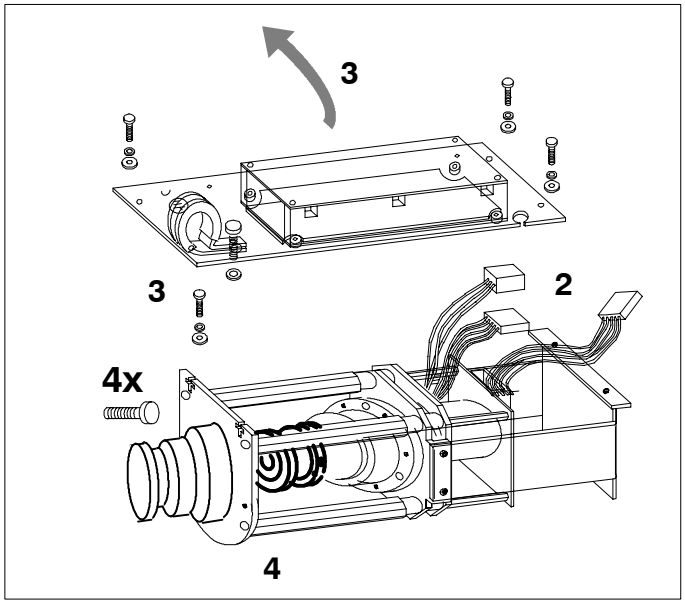
- Switch system **ON**.
- Position telescopic tube.
- Lock telescopic system by using the supplied screw M10.
  - Lock it via the hole into the thread.
- Switch system **OFF**.

4.6.1. Replacement of the tomo alpha Motor



- Switch system **OFF**.

- Dismantle the α-drive **1**.
  - Remove screws and covers.



- **2** Disconnect the external cables to the tomo control.

- **3** Remove the tomo control including mounting plate.

- **4** Remove the tomo drive.
- Loosen grub screws **5** on the tomo drive support arm.
- Remove four screws (**4x**) to the tube support.
- Remove the tomo-α-drive

- Disassemble the tomo-α-drive
  - Replace the motor. Assemble the drive.

- Assemble in reverse order as specified above.

4.6.2. Replacement of the Height Sensor

See Ceiling Suspension Tracking Function.

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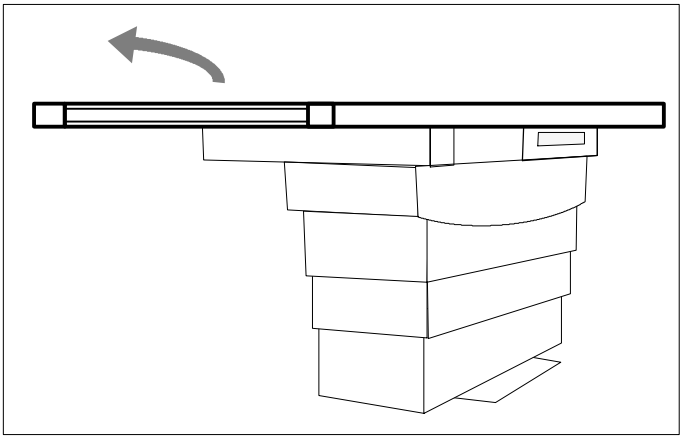
5. Replacement of Table tomo Assemblies

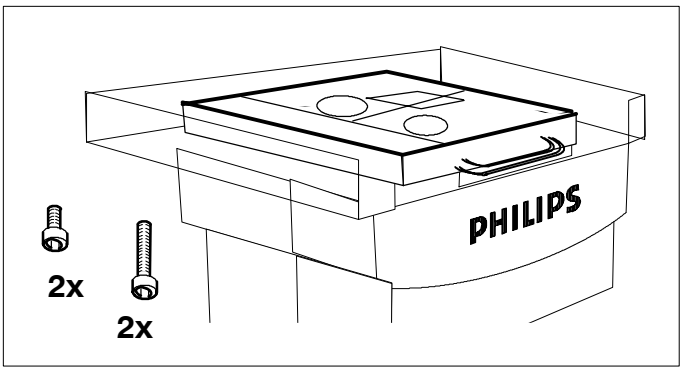
5.1. Preparatory work

Switch **OFF** the system.

- Remove the end stops from the table top.
- Remove the table top.



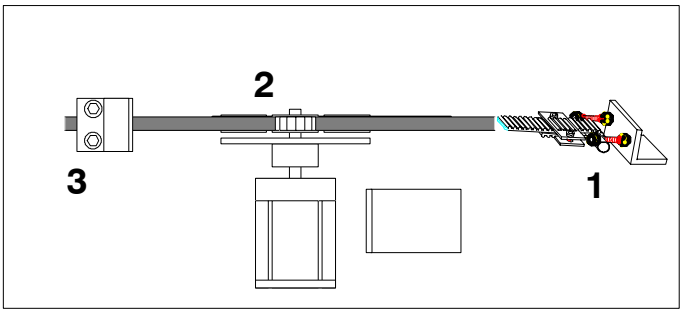
- Remove screws at the underside of the bucky unit.
- Disconnect the plugs and the ground connection.
- Disconnect the plug on the AMPLIMAT measuring chamber.
- Remove the complete bucky unit from the bucky carriage.



Handle the bucky unit with care and secure it against damage.

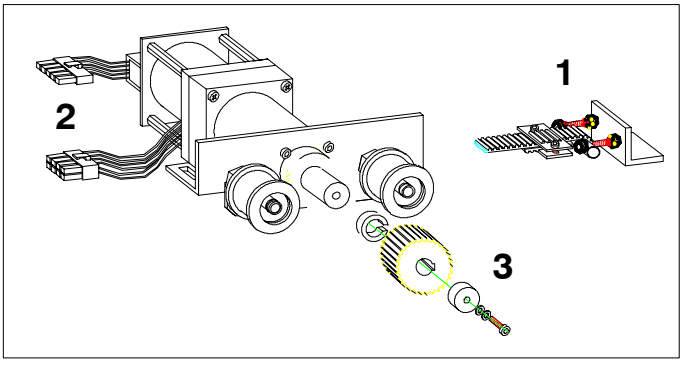
5.2. Replacement of the tomo Belt

- **1** Relieve belt of the spanner.
- Loosen screws of the two belt holders.
- **2** Remove the toothed belt from the tomo motor, replace the toothed belt.
- **3** Insert the new toothed belt so that **one** tooth is outside the two belt holders.



5.3. Replacement of the tomo Motor

- **1** Relieve belt of the spanner.
- Remove the toothed belt from the tomo motor.
- **2** Disconnect the motor from the printed-circuit board.
- **3** Loosen the grub screw, remove the gear.
- Remove the four screws, replace the motor.
- Assemble in reverse order as specified above.



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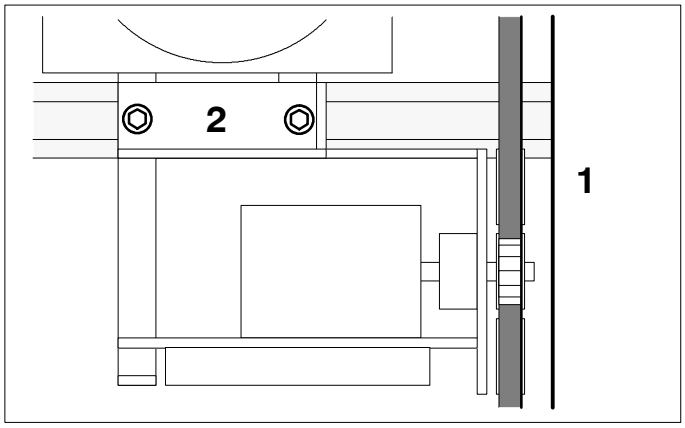
5.3.1. Check of Centering the tomo Drive

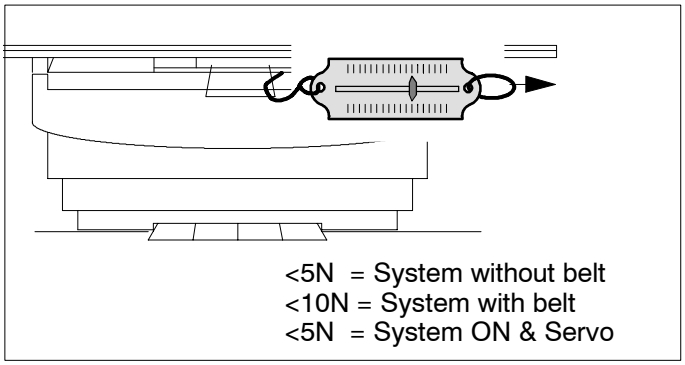
- Move the ceiling suspension over the whole longitudinal range and check whether the toothed belt runs **parallel** to the rails **1**.
  If necessary, adjust the tomo motor unit by loosening the two fixing screws **2** in the transverse rail.

- Ensure that the screws are tightened after adjustment.



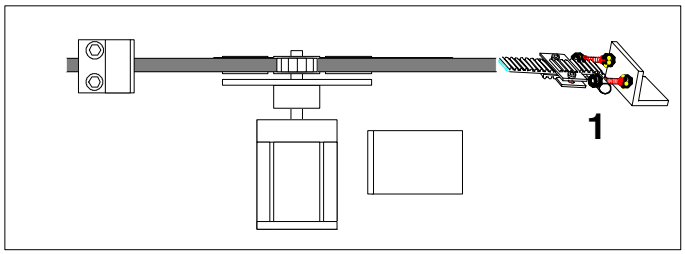
5.3.2. Adjustment of Tomo Force

- Move the table to its center position.
- Switch **OFF** the system.
- Hook a spring balance into the handle.
  - Pull with the spring balance.
    The value of force is <10N.
- Switch **ON** the system.
- Hook a spring balance into the handle.
  - Pull with the spring balance.
    The value of force is <5N for a system with Servo.



If necessary, loosen or tighten the belt via the screw **1**.

- Repeat the procedure as described above.



If the belt oscillates, it must be tightened.

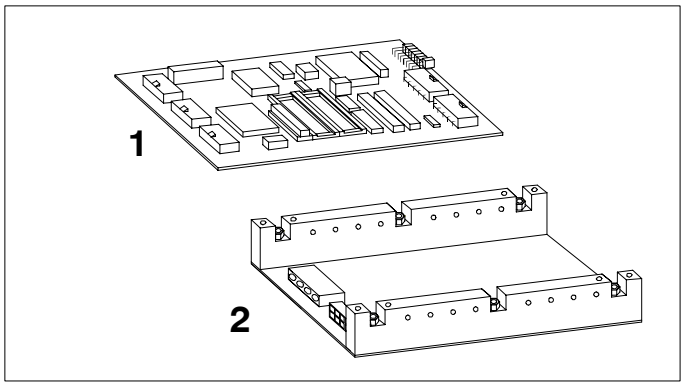
5.4. Replacement of the tomo Controller

For preparatory work see **Preparatory work.**

- Disconnect all plugs to the boards.

- Dismount the tomo controller.
  - Replace the defective board **1** or **2**.

- Assemble the items.



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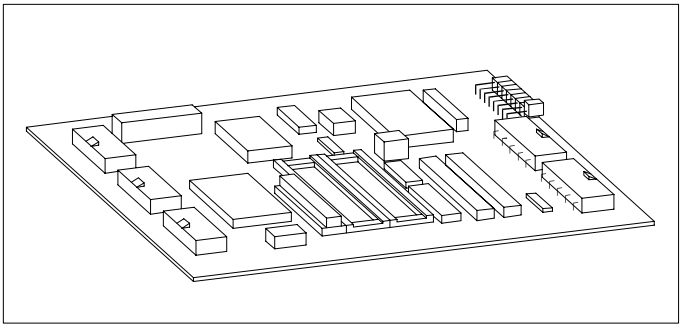
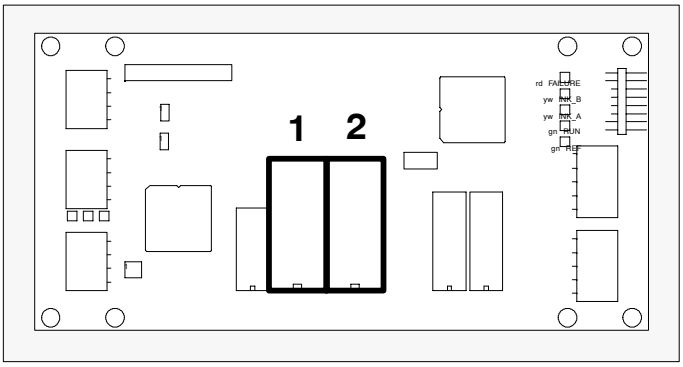
5.4.1. Exchange of EPROMs

Note
Before starting to exchange the EPROMs, use the antistatic kit.



- Remove the tomo controller
- Pull out carefully the printed-circuit board.



- Exchange EPROMs
  - **1** CAN
  - **2** MOTOR

Note
Observe that the locations of the EPROMs are different! Make sure that the polarity is correct!

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6. Replacement of the batteries on the bucky controller

Scope of delivery

Li-battery code no. 2412 526 00162

Manpower

One service engineer, 1 hour.

Tools required

Standard tool kit

Antistatic kit

Introduction

The lifetime of the battery is approximately ten years.

However, after a run of four years or every leap year the Li-batteries (Code no. 2412 526 00162) on the bucky controller (SZ1/G2) and at the OPTIMUS generator (EZ119/G2 and EZ139/G4, see OPTIMUS generator documentation) must be replaced at the same time.

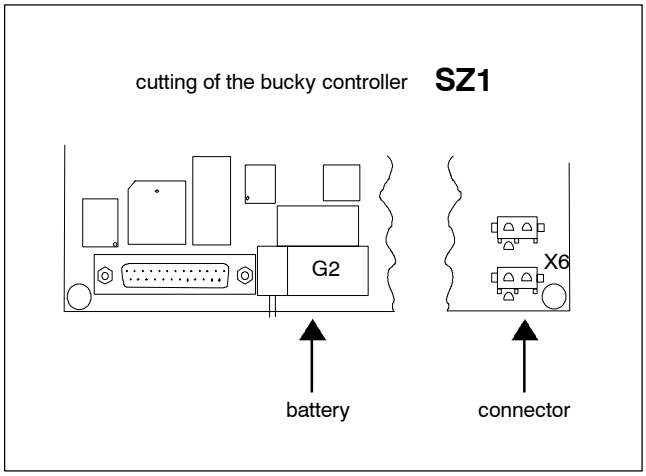
Procedure

- Switch OFF the system.
- Disconnect the bucky controller SZ1

Note

Use the antistatic kit.

- Remove bucky controller from the table.
- Connect 24 V cable buco X6-power supply at the bucky controller.
- Switch ON the system, so that the supply of electricity of the RAMs is done by SAN 1 power supply.
- Replace the battery G2.
- Switch OFF the system.
- Install the bucky controller vice versa.



7. Final work

- Switch ON the system and check functions of TOMO, cassette sensing, recording and tracking.
- Hand the system over to the customer.

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BUCKY DEVICE

DRAWINGS

BuckyDiagnost TH2 with bucky unit non sensing	8Z-1
BuckyDiagnost VE2/VT2 with bucky unit ACL4	8Z-2
BuckyDiagnost VE/VT and VE2/VT2 with bucky unit non sensing	8Z-3
BuckyDiagnost TH2, ACL4 and bucky controller	8Z-4
BuckyDiagnost VE/VT bucky unit with sensing and bucky controller	8Z-5

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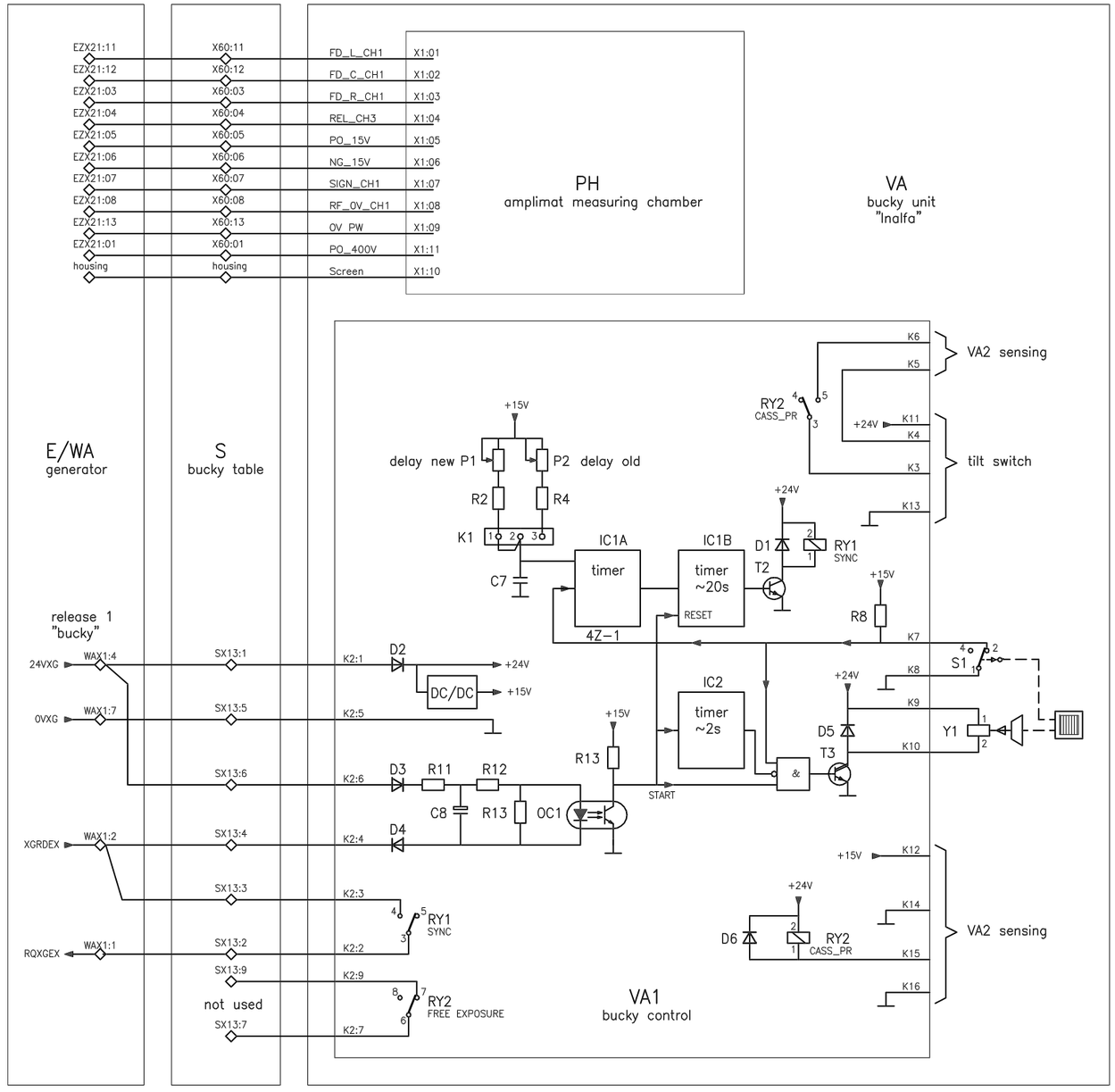

A1/A3 99-04-06 Ost./Yeo
smcm4z41

bucky DIAGNOST TH2
with bucky unit non sensing

8Z-1

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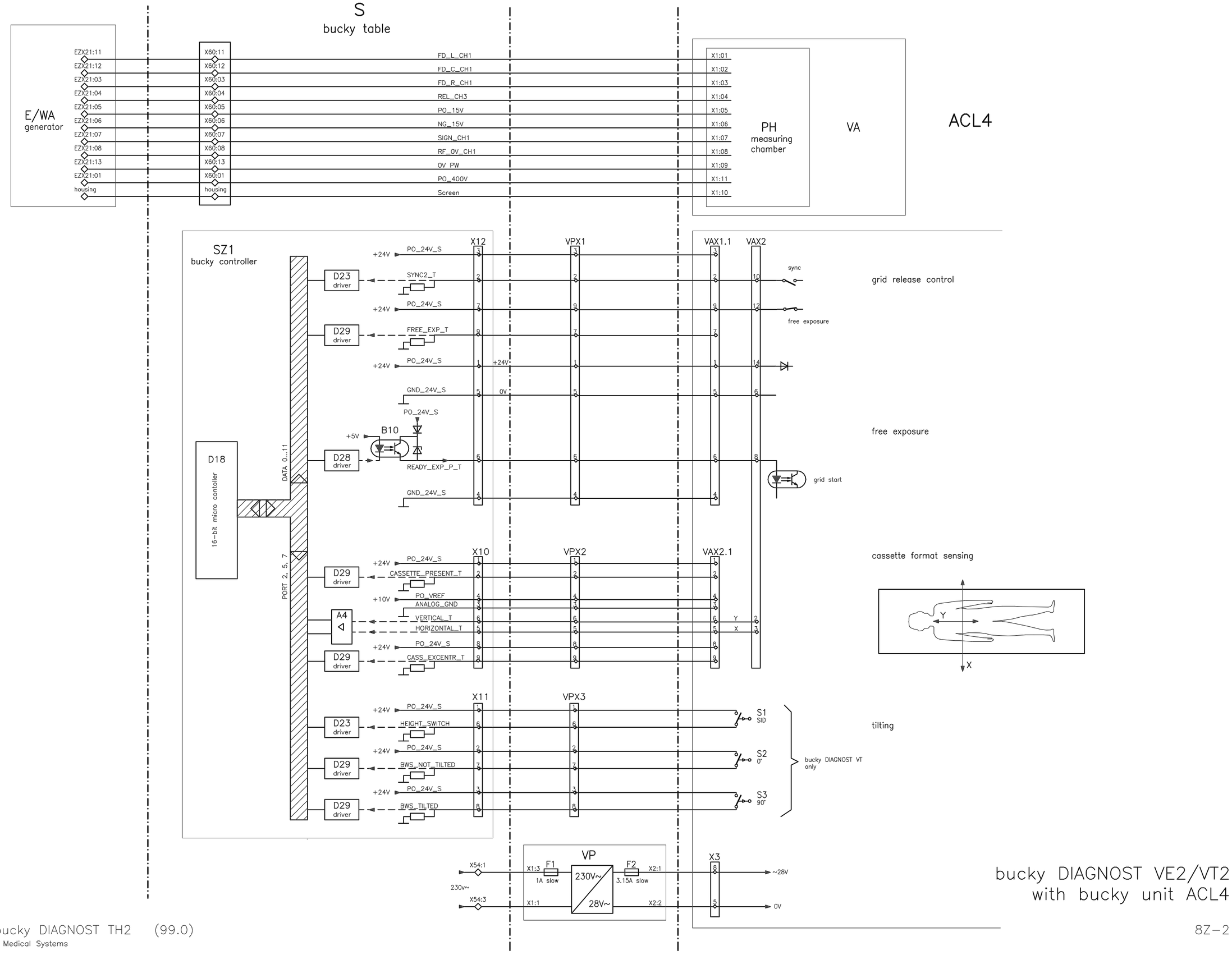

A1/A3 99-04-09 Ost.
smcm4z42

bucky DIAGNOST VE2/VT2
with bucky unit ACL4

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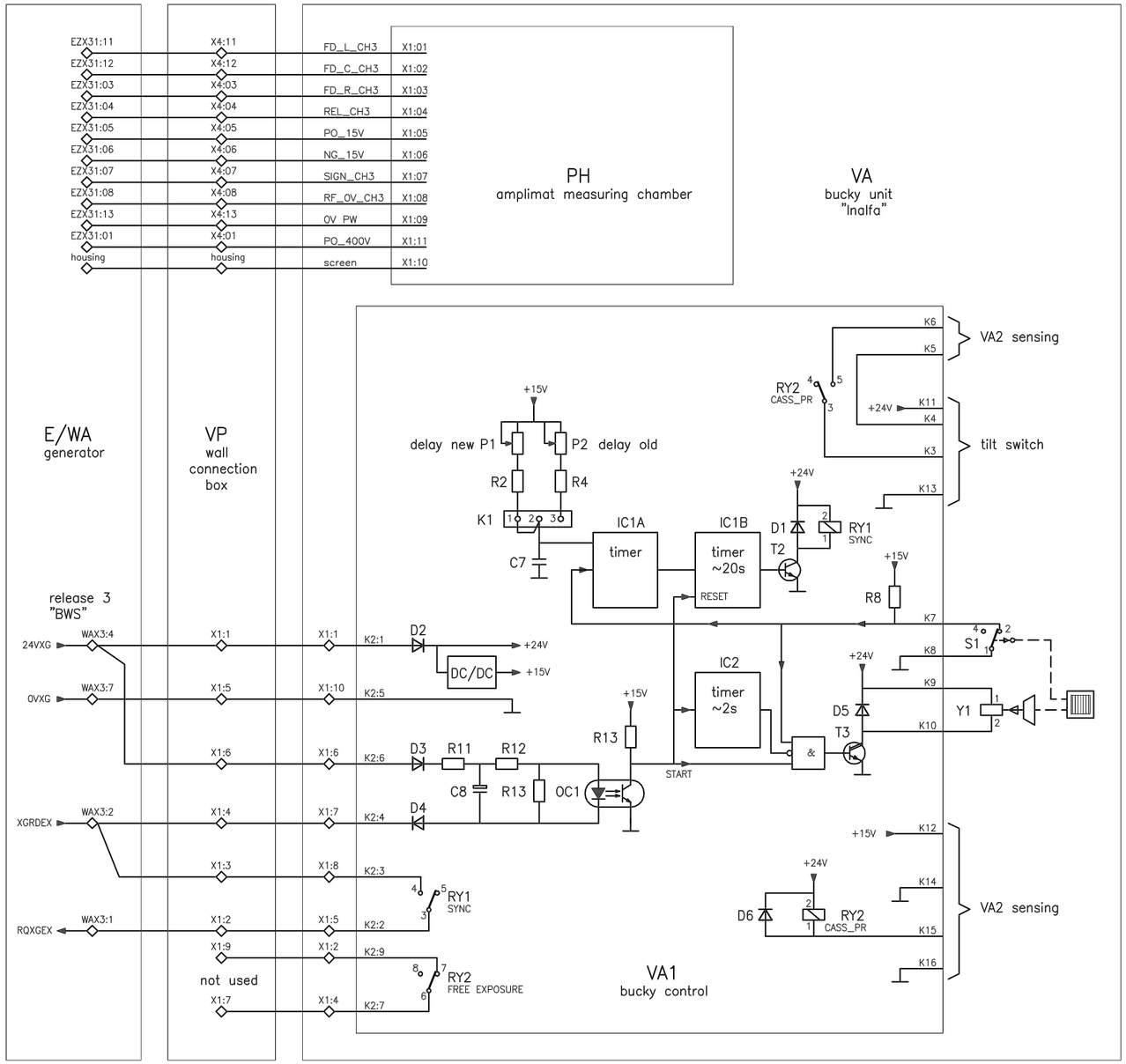
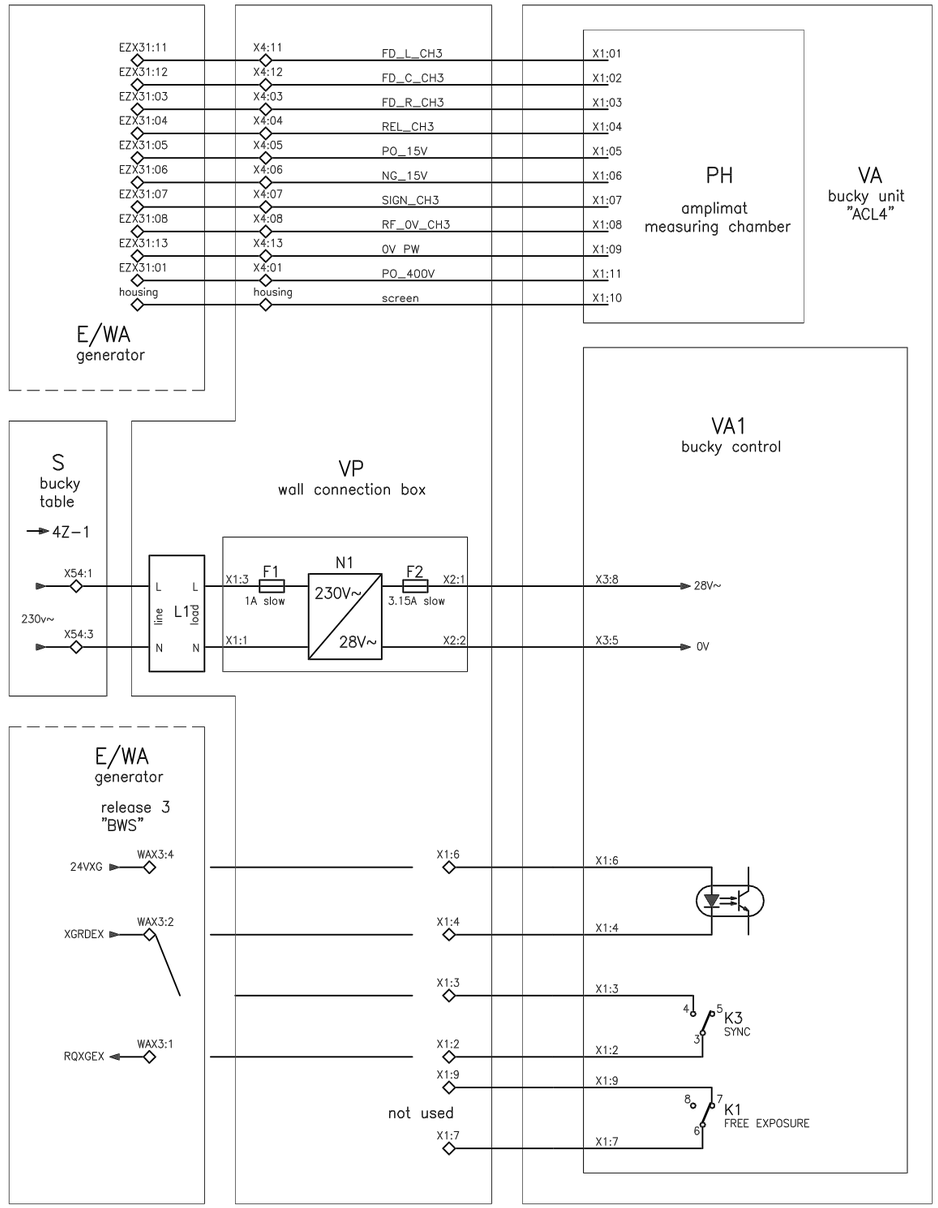
bucky DIAGNOST VE/VT with bucky unit Inalfa



or

bucky DIAGNOST VE2/VT2 with bucky unit ACL4



A1/A3 99-04-06 Ost./Yeo

bucky DIAGNOST VE/VT and VE2/VT2 with bucky unit non sensing

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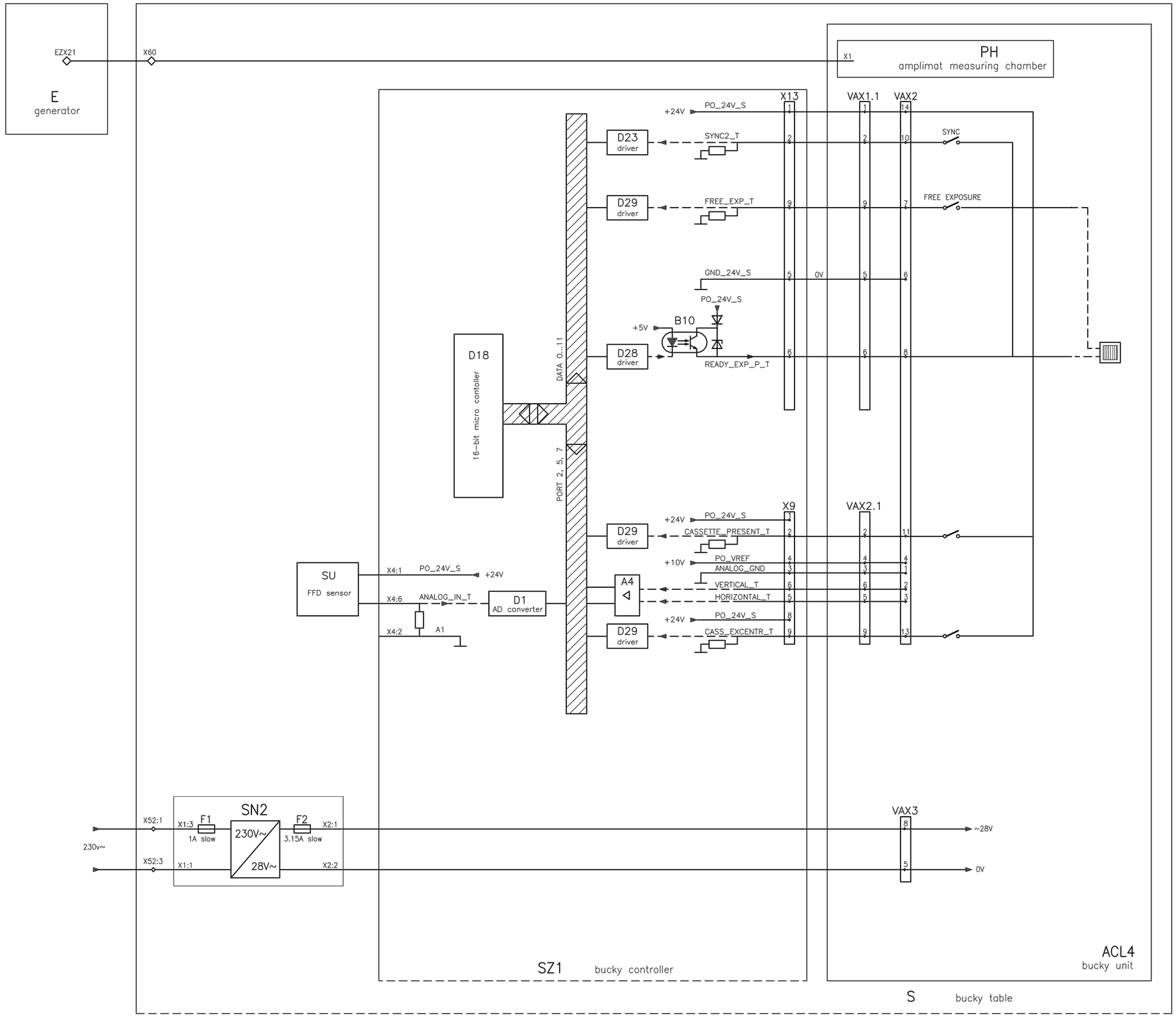

A1/A3 99-04-08 Ost.

bucky DIAGNOST TH2
ACL4
and bucky controller

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bucky DIAGNOST VE/VT
bucky unit with sensing and bucky controller

8Z-5

E
generator
EZX21
X60
X4
X1
PH
amplimat measuring chamber
SZ1
bucky controller
D18
16-bit micro contoller
DATA 0..11
PORT 2, 5, 7
D23 driver
D29 driver
D28 driver
X12
X10
X11
X1
X2
X3
PO_24V_S
SYNC2_BWS
FREE_EXP_BWS
GND_24V_S
READY_EXP_P_BWS
CASSETTE_PRESENT_BWS
PO_VREF
ANALOG_GND
VERTICAL_BWS
HORIZONTAL_BWS
CASS_EXCENTR_BWS
HEIGHT_SWITCH
BWS_NOT_TILTED
BWS_TILTED
+24V
+10V
+5V
B11
A5
S
bucky table
VP
wall connection box
RY1 SYNC
RY2 FREE EXPOSURE
D2
DC/DC
+15V
0V
D3
D4
R11
R12
R13
C8
OC1
delay new P1 2–10ms
P2 delay old 6–60ms
R2
R4
W1
C7
IC1A
timer
IC1B
timer ~20s
RESET
T2
D1
R8
IC2
timer ~2s
&
D5
T3
START
K7
K8
K9
K10
S1
Y1
CASS_PR
D6
VA1
bucky control
X23
X22
X21
X20
X32
X33
X8
X7
X9
X10
X29
X31
X6
X5
R381
B6C
B204
B206A
VRI
VREF+
VREF–
B2
B1
B3
horizontal
vertical short
vertical long
X21
X20
X22
B9 comparator
B7 comparator
B8 comparator
B210
B211
B209
B212
PROM
DA conv.
B104
B4
B6A
B6B
V_HOR
V_VERT
R379
R380
signal cas. excentr.
VA2
cassette sensing
VAS2 cass. tray pos. switch
VA
bucky unit
S1 SID
S2 0°
S3 90°
bucky DIAGNOST VT only
bucky DIAGNOST VE/VT
A1/A3 99-04-06 Ost./Yeo
SMCM bucky DIAGNOST TH2 (99.0)
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Tomography Run
Tracking
Sensing
Trauma

DRAWINGS

BuckyDiagnost TH2, Control CS 2/4 with sensing or tomo	9Z-1
Tomo control BuckyDiagnost TH2 and CS with tomo	9Z-2
BuckyDiagnost TH2, CS and VE/VT with tracking	9Z-3
BuckyDiagnost trauma Control CS 2/4	9Z-4
AMPLIMAT measuring chamber BuckyDiagnost trauma and bucky carriage	9Z-5

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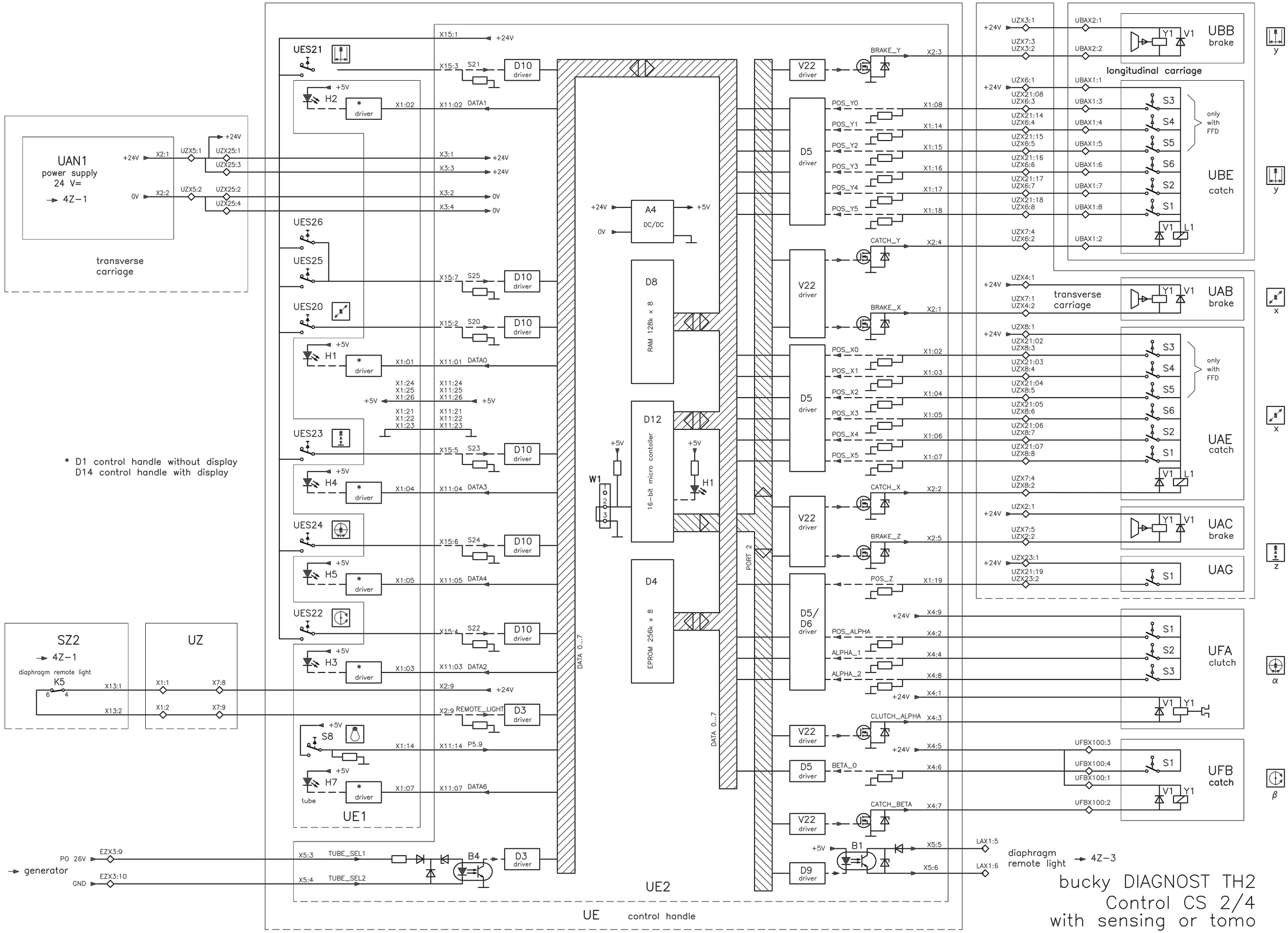

* D1 control handle without display
D14 control handle with display

A1/A3 99–04–06 Ost./Yeo

bucky DIAGNOST TH2
Control CS 2/4
with sensing or tomo

9Z–1

SMCM bucky DIAGNOST TH2 (99.0)
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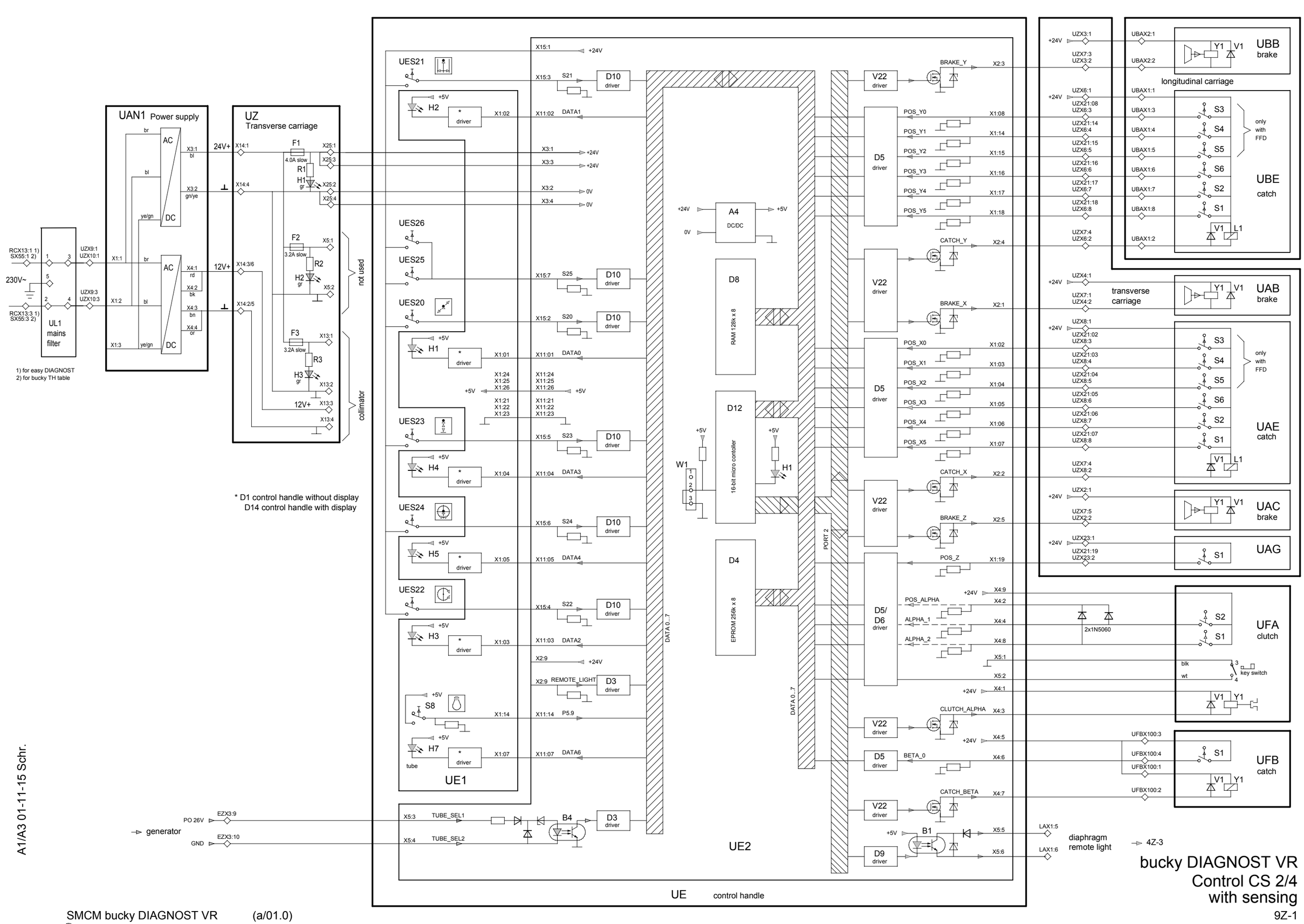

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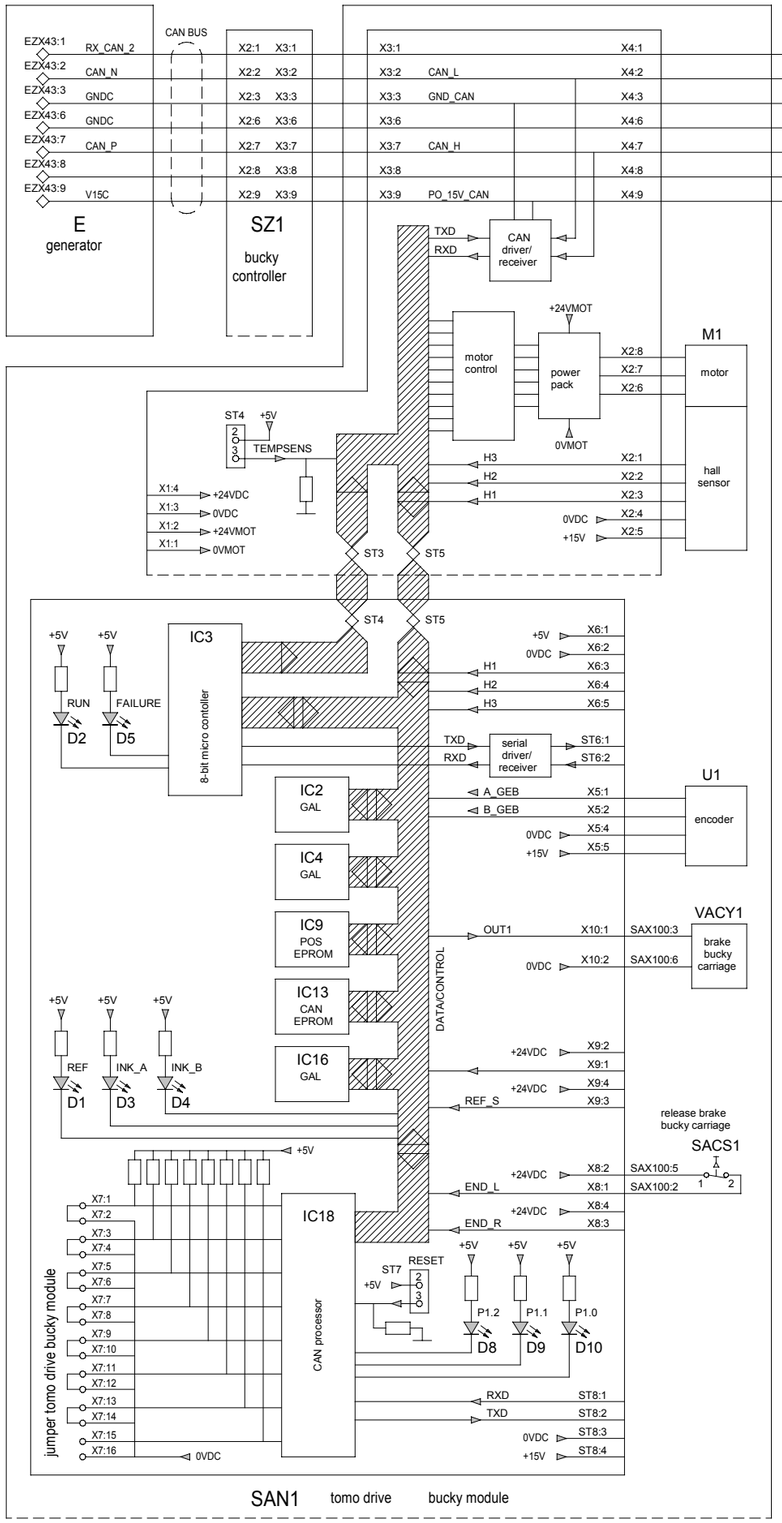
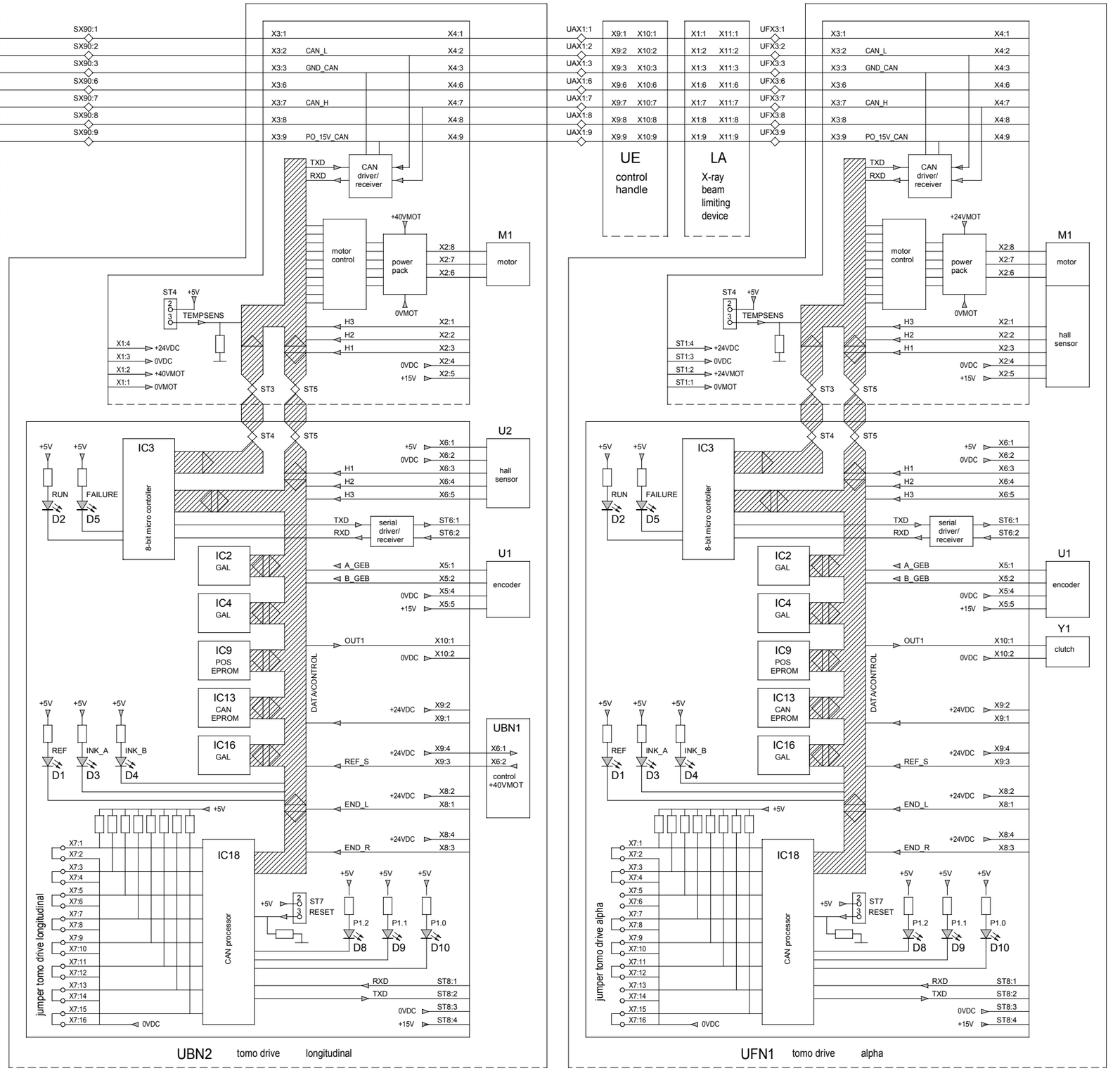
bucky DIAGNOST TH2



SAN1 tomo drive bucky module

bucky DIAGNOST CS2/CS4



UBN2 tomo drive longitudinal

UFN1 tomo drive alpha

bucky DIAGNOST TH2 and CS with tomo
Tomo control

A1/A3 01-07-11 Ost./Schr.

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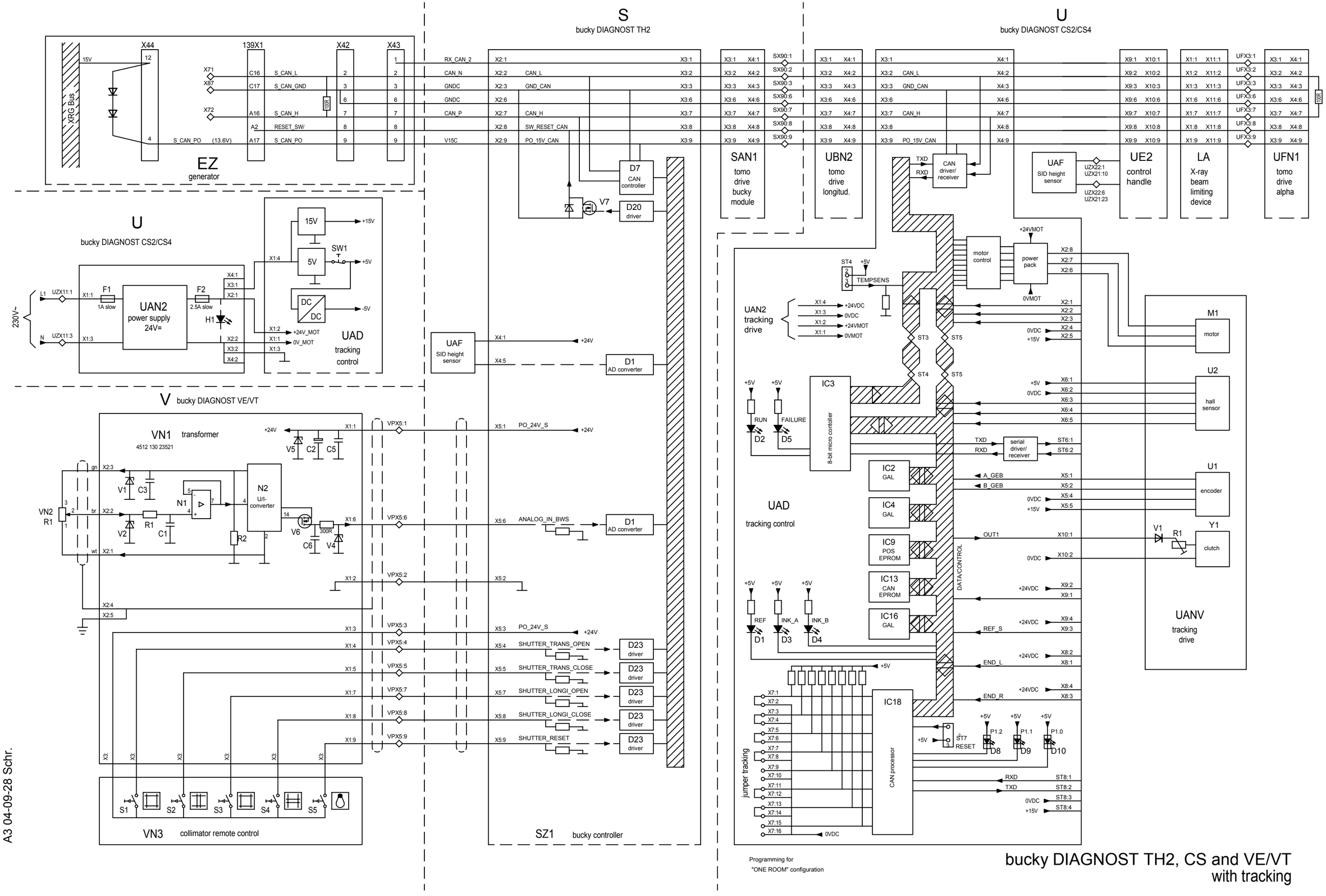
bucky DIAGNOST TH2, CS and VE/VT with tracking



Programming for
"ONE ROOM" configuration

A3 04-09-28 Schr.

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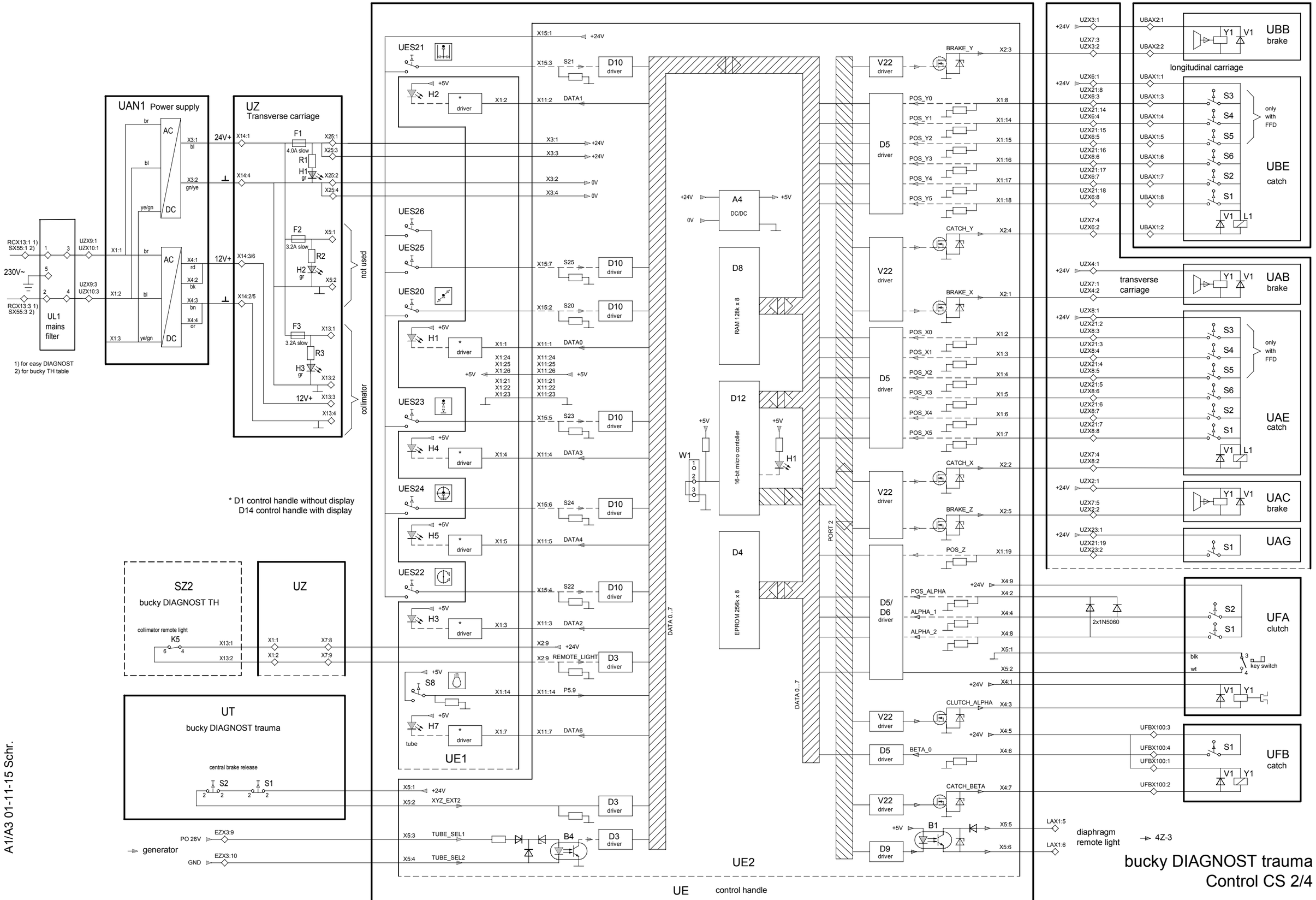

A1/A3 01-11-15 Schr.

SMCM bucky DIAGNOST TH2 (a/01.0)

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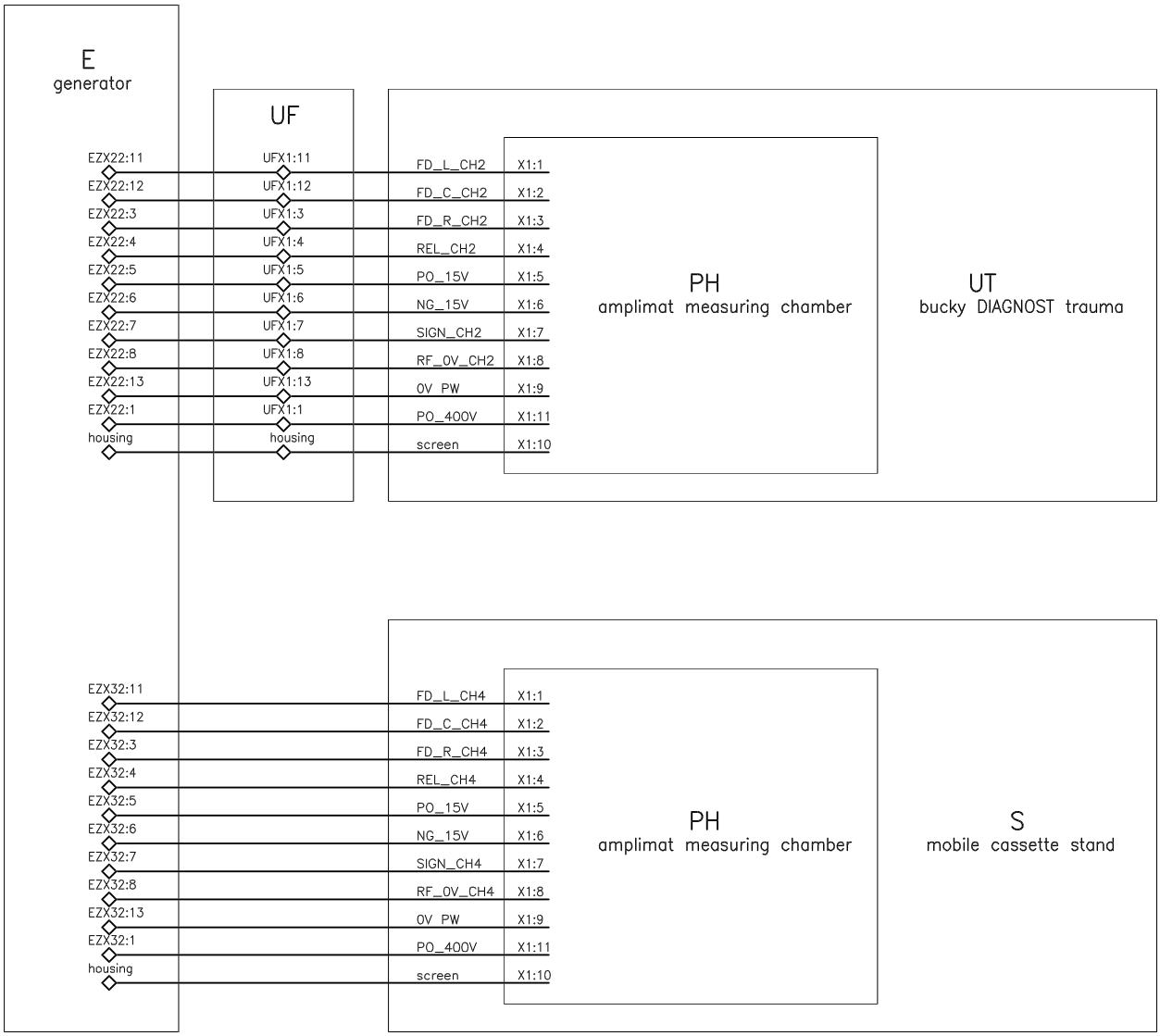

A2/A4 99-04-06 Ost./Yeo

bucky DIAGNOST trauma and bucky carriage amplimat measuring chamber

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COLLIMATOR

DRAWINGS

bucky controller with CS 2/4 and automatic diaphragm 10Z-1

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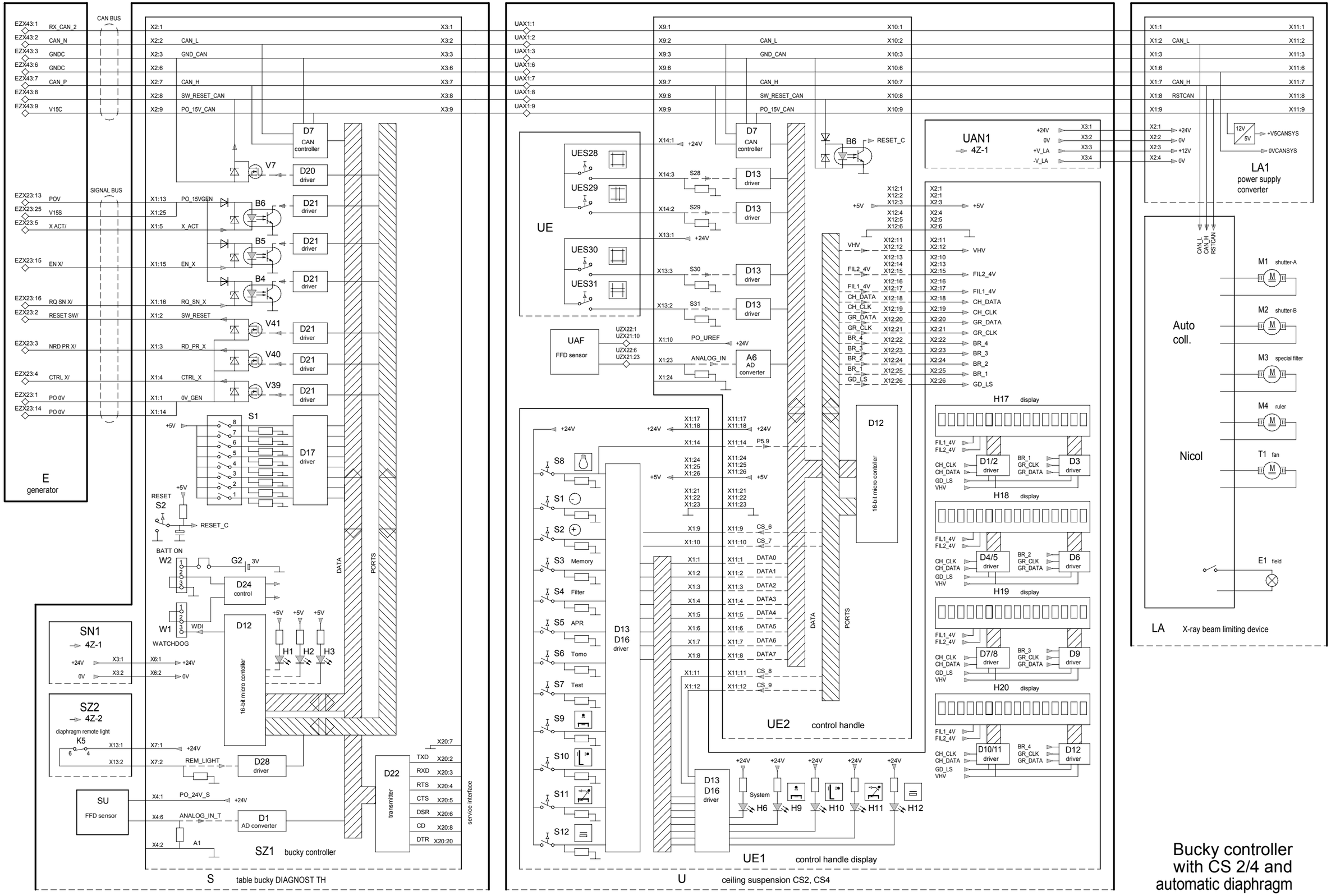

A1/A3 01-11-15 Schr.

Bucky controller with CS 2/4 and automatic diaphragm

SMCM bucky DIAGNOST TH2 (a/01.0)

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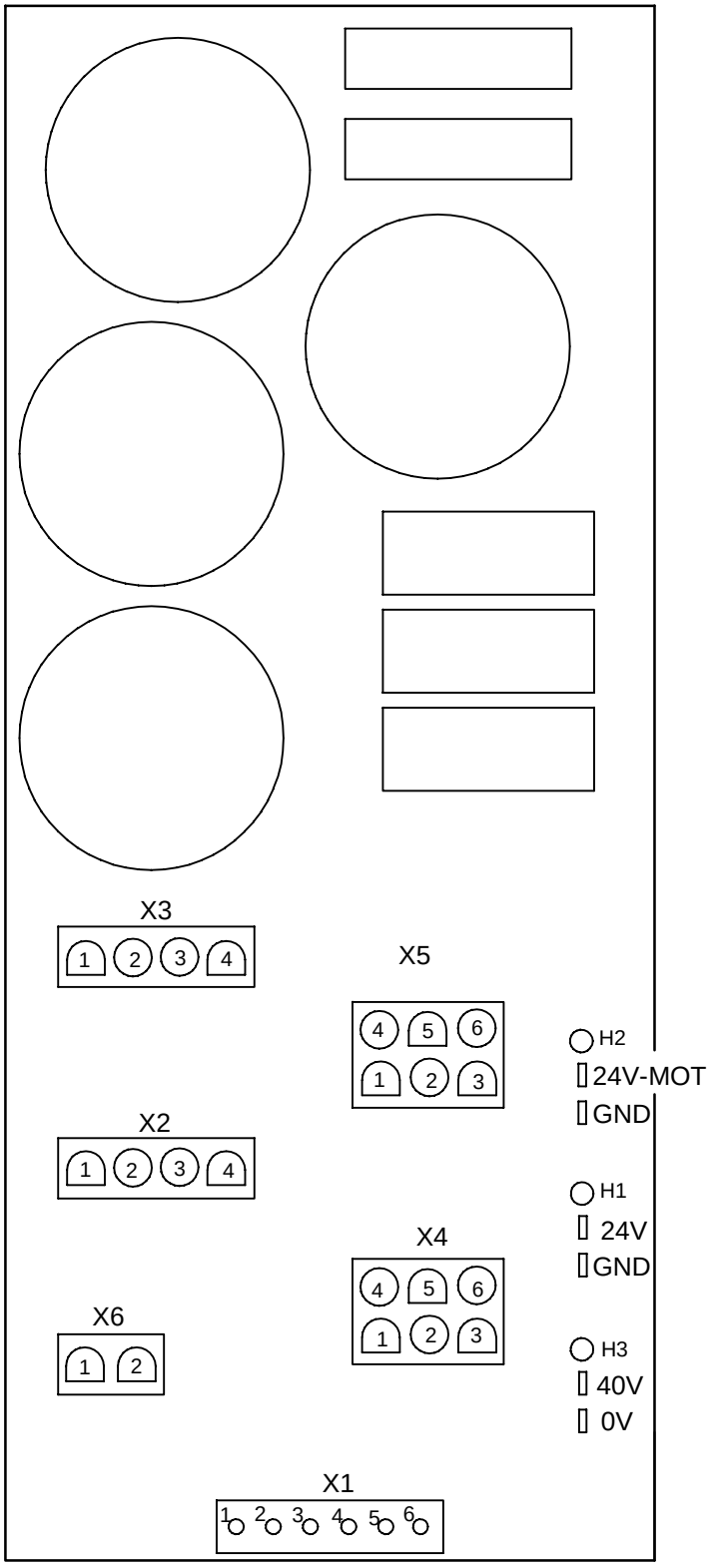
10Z-1



A4 00-08-18 Schr.
SMCM_BD_TH2_z31

UBN1
Location plan
Tomo safety circuit

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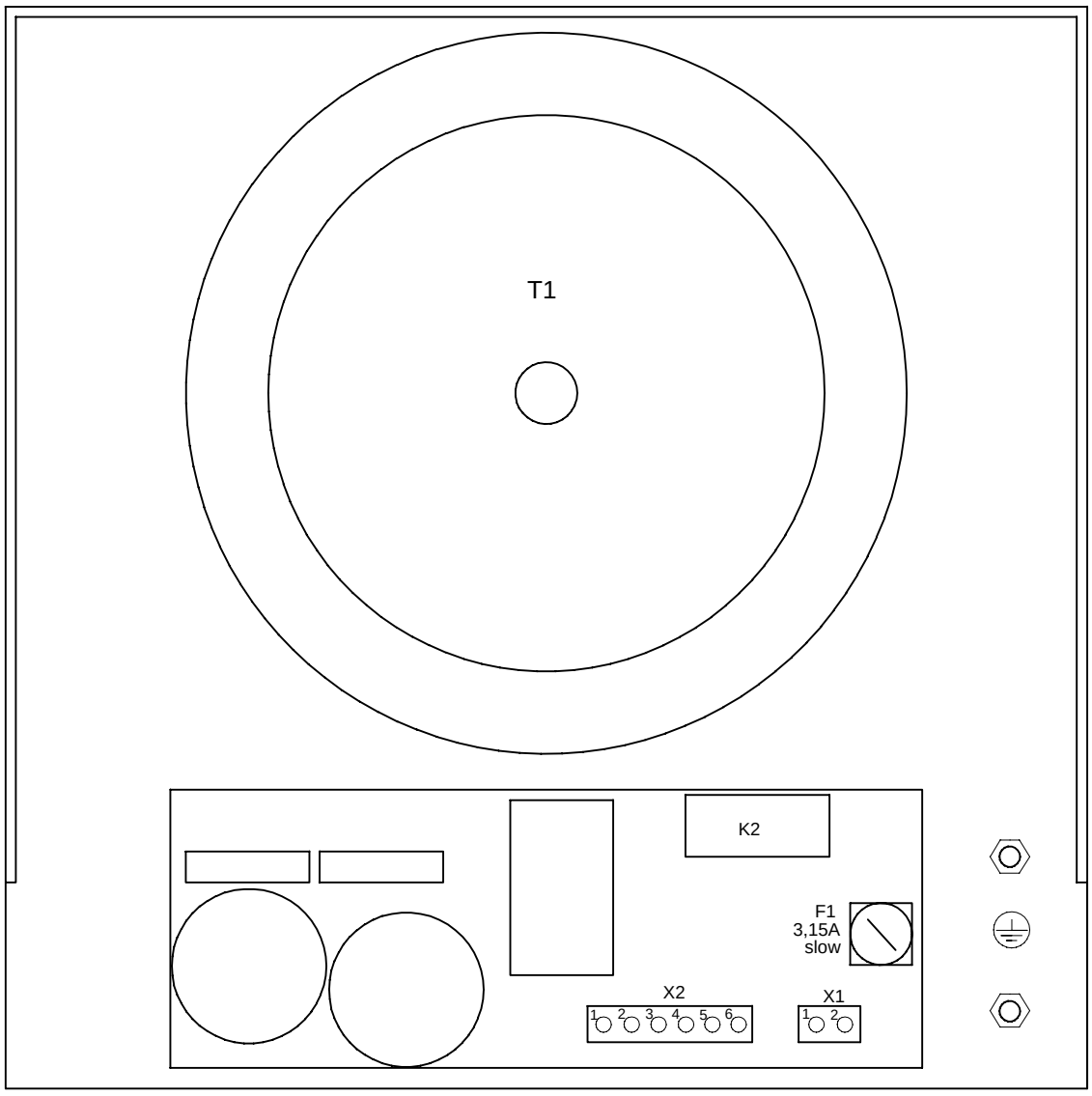

A3/A4 00-08-18 Schr.
smcm_bd_th2_z32

UBN3
Location plan
Tomo 2 Power supply

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